The Chemical Age

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Notes and Comments

British Filter Presses

THE members of the British Chemical Plant Manufacturers' Association who are particularly interested in the production of filter presses have been giving serious consideration to the position of the home production relative to the importation of foreign filter presses, as set out in detail in the supplement to the "Board of Trade Journal" for June 9, 1932, which summarises the cencus of production data on the mechanical engineering trades. These members feel that far more foreign filter presses are imported than is warranted by the competence of the British maker to manufacture any type of filter that may be required. At the same time they recognise that the confirmation or modification of this opinion can only be secured by a co-operative policy between makers and users, which will enable them to ascertain precisely why orders for filter presses are placed abroad.

The Association has accordingly issued a letter and questionnaire to all important users of filter presses whose names it can ascertain, in order that a body of useful information may be secured as to the reasons why it is still necessary to import foreign filter presses. With this information before it, the Association intends to investigate the whole position, and to make a special effort to ensure that the whole of the British requirements can be met by British makers. The questionnaire has been drawn up for completion by users and return to the offices of the Association and has been limited to broad issues in order that users may be able to provide helpful information with the minimum of trouble to themselves. As detailed information as possible under the various headings indicated, or other additional points which may be relevant in the experience of individual firms is requested.

A General Investigation

WHILE the British Chemical Plant Manufacturers' Association is, in the first instance, directing its attention to the matter of filter presses, it proposes to carry out at a later date a comprehensive investigation into each of the main classes of products manufactured by its members and sold to chemical manufacturers in this country. It is felt that valuable guidance towards such future investigations could be obtained if the users of chemical and allied plant would assist by indicating those lines in which they consider that the British chemical plant manufacturer more particularly fails by comparison with the foreign producer, with the consequent necessity for the importation of foreign plant.

Mr. J. Davidson Pratt, secretary of the Association, has therefore invited all plant users to submit to the Association whatever information they may be able to offer on the basis of their own experience as to the lines in which they consider the foreign chemical plant manufacturer to be in advance of the British, taking into account design, constructional materials, quality and price. Needless to say, the source of any particular information will not be indicated without the permission of the firm concerned. In view of criticisms which have been raised from time to time we are glad to notice that the British plant manufacturers are arousing themselves to the necessity of taking the users into their confidence, and we welcome the opportunity of co-operating with the Association in making known to any plant users who may have been inadvertently omitted from the Association's list the fact that their observations will be welcomed. We suggest to any such users that they apply to the Association, whose address is 166 Piccadilly, London, W.1., for copies of the questionnaire and covering letter.

Team Work and Co-operation

THE British Thomson-Houston Company has recently provided a valuable lesson and example for British industry in general. It secured, in the face of intense world competition, an order for a special 7,500 h.p. rolling mill motor which had to be completed and tested in nine weeks from receipt of order. Actually, it completed this job in the extraordinary time of 50 days. This shows what can be done when an industrial management possesses the necessary courage and vision to grasp the possibilities of a problem without being frightened by the difficulties of it, and also the organising ability to overcome those difficulties, and is backed up by whole-hearted team work, not only from its own staff, but from its outside suppliers. For the performance of this manufacturing feat was only made possible through the co-operation of the suppliers who delivered the great quantities of steel, sheet iron, and copper required in 18 days. Compare this with a case recently mentioned by Lord Elibank in a letter to the "Times." A Canadian firm cabled to England an order for a certain class of wrapping paper. The English paper makers replied by letter asking how the paper was to be packed! Meantime the Canadian firm, receiving no cabled reply, and badly wanting the paper, telephoned an order to the U.S.A., and got the paper delivered before the letter from England arrived.

We undoubtedly want more of the British Thomson-Houston spirit in the chemical industry. More alertness to make and grasp new opportunities; more courage to get out of the rut and adopt a progressive and aggressive policy backed by modern methods. To borrow the wording of a current advertisement, we want to

be " Mr. Can " and not " Mr. Can't." We also want a lot more co-operation and getting together to study mutual needs and the requirements of customers at home and abroad.

Group Selling in the Empire

REVERTING to our notes last week regarding the scheme submitted by Dr. E. F. Armstrong to the Association of British Chemical Manufacturers for the establishment of a group sales organisation for Empire trade, a student of chemical statistics points out that one rather disturbing feature about it is the small membership, which only amounts to 109. No doubt this membership includes most of the big establishments, and probably covers quite a big percentage of the total capital invested in the industry, but numerically it is decidedly feeble. According to the Preliminary Reports of the Board of Trade Census of Production for 1930 which have so far appeared, there were in the United Kingdom 572 establishments, excluding those employing less than ten persons, engaged in the production of chemicals, dyestuffs and drugs. Of this number the A.B.C.M. membership represents only 19 per cent. But when we add to this figure the allied businesses which must be included in the chemical industry, the position of the A.B.C.M. is much worse. In the Reports which have appeared so far we find the following numbers of establishments: —

Chemicals, dyestuffs, and drugs	572
Glass	286
Soaps, candles and perfumeries	183
Oil, tallow	176
Fertilisers	163
Cement	84
Starch and polishes	75
Ink, gum, and sealing wax	66
Explosives	47
Sugar and glusoce	46
Matches	34
Petroleum refining trade	26
Spirit rectifying, compounding and methylating	22
Total	1,780

Even this list is incomplete, for it does not appear to include paints, varnishes, and lacquers, or synthetic resins, to mention a few obvious omissions, but taking a total of 1,780 the A.B.C.M. membership is only 6 per cent. of it. It is ridiculous to talk of a national selling organisation for the Canadian market if this is going to be run for the benefit of only 6 per cent. of the chemical manufacturers of the United Kingdom. The small concern has just as much right as the big concern or group, and far greater proportionate need, to be fully represented in any combined selling organisation. In the past the big concerns have probably rendered service to the small ones by the formation of international cartels for the maintenance of prices and the exclusion of dumped foreign products, but now that tariffs are taking on the latter task, the interests of the small manufacturer should receive more consideration. Incidentally, high prices are not always an unmixed blessing, for, in the chemical industry particularly, the finished products of one manufacturer are often the raw materials of another. It would be of interest to hear from the A.B.C.M. what it is doing to help the small manufacturer, and we should be interested to learn from chemical manufacturers who are not members of the Association the reasons which hold them back from joining it.

New Uses for Coal

COAL utilisation problems were discussed from widely different points of view in London last week. On October 19 Sir Hugo Hirst, in his presidential address to the Institute of Fuel, stressed the need for an organisation to undertake coal research in the interests of the coal industry and of the nation generally, and on the following evening Dr. Benton Jones, vice-president of the Mining Association of Great Britain, speaking at the annual dinner of the Coke Oven Managers' Association, strongly denied that the coal industry did not busy itself sufficiently in the matter of research, and pointed out that although it had no large central laboratory of its own, it did in fact support the Universities in different parts of the country in work relating to the nature of the coal in the particular district. Sir Hugo Hirst advocated an organisation to deal authoritatively with all matters relating to the preparation of coal for the market, with the known uses of coal and the prospective uses, and said the necessary financial support would be easily forthcoming by imposing a fifth of a penny per ton on all coal raised, giving a total of at least £200,000 per annum. He contended that research in the coal industry has been bitterly disappointing, both on the domestic side and in relation to steam raising and industrial uses. Even the advent of hydrogenation, with the immense possibilities which it seemed to offer, did not stir the coal owners and it was only after the largest chemical organisation in the country had become interested in the production of petrol from coal that a few of the coal owners became warm-hearted supporters of the hydrogenation scheme.

Efficient Fuel Utilisation

QUESTIONS of coal carbonisation are closely allied with those of the chemical industry, both from the point of view of the chemical products and the broader matter of efficient utilisation, and it was fitting that this intimate association should have been recognised in the speeches at the Coke Oven Managers' Association dinner, at which Professor Henderson, president of the Chemical Society, responded to the toast of the Universities. The dinner was noteworthy principally for the speeches of Dr. Benton Jones, to which we have already referred, and of Mr. R. G. Clarry, M. P., chairman of the British Road Tar Association. Dr. Benton Jones, by the way, provided the coke oven managers with food for thought in his comments on the economic size of coking units, which did not altogether coincide with the views of some of the managers. Mr. Clarry, speaking as a gas engineer, a politician and chairman of the British Road Tar Association, emphasised that if present conditions continued, with the influx of oil into this country, our prosperity would hang on an oil pipe line, over which we should have no control. The price of oil could be raised in a day and nothing could be done. It is, as Mr. Clarry said, essential that those who are dealing scientifically with the coal resources of the country should educate the consumer in the correct way to use coal in the most efficient manner.

The Institutes of Chemistry

By Professor H. E. ARMSTRONG

Now that Burlington House officialdom has disclosed its hand and we are openly told of the intention to wave the pennant of the Chemical Society in the outside cities as well as in London, we may discuss the situation without risk of vote of censure for betraying well-known secrets—just as if we were politicians, prepared to slang each other to the last damn when in conference, whilst the best of friends in private!! knowing that we must force ourselves to act as rational beings, not as Gilbertian children, unable to brook any criticism.

Let Lord Carson be our model. No man's example could better serve our present needs; no man has set a higher standard of steadfast purpose and determination. In the recently published Life of his Lordship (by E. Marjoribanks), we are told that he fought most bitterly in Parliament with the Attorney-General Lawson Walter, yet on his death in the following year, he could say of him: "It is to me a real permanent loss. *He was an enemy and yet at the same time a great and dear friend.* We have been opposed to each other very many times in the Law Courts and we had bitter hostilities in the House of Commons; but during all the long years we were never anything but the greatest real friends."

The Mission of the Pilgrims

However loudly the Chemical Society may sound its loud trumpet, its elbow to lead has for the present lost its power. The pilgrims are sent out to do extra-Metropolitan penance too late to secure forgiveness of parental sins. The lure the London Venusbergs have for the young provincial knights is well known and is likely to be more seductive than the charms of any missionary sent down for their local conversion. Other less exclusive interests than those of the parent society are in the saddle. Paternal measures such as are contemplated will not heal the long established sores. Whatever enthusiasm the appearance of an Aston Villa heavyweight champion, native to the town, may arouse in Birmingham, we cannot see that "The Post" will be able to make much in its columns of Physical Atomic Weights—the kind of drill evolved in their evolution has little to do with either brass or beer. The brass will come from the society, in putting such goods upon the Midland market as a means of encouraging fraternal relations with industrial science. A lecture on the most accomplished log-roller of modern times is scarcely likely to help in restoring prosperity to Liverpool. An example of higher scientific morality were better set before its chemists. If we are to buy British surely we should also lecture British. We might well seek to recover the past by lectures, let us say, on the past presidents of the society, beginning with Graham.

Nothing short of a general union of all our forces can save the situation. The absurdity of the position is best shown by the fact that the one really popular branch of work to-day is the so-called biochemical. This combines the *pH* attractions of physical chemistry with those which the study of materials of natural origin have always offered. The real work done by the school is purely chemical and as much within the province of the Chemical Society as any other work that is submitted to it; yet, in some way, most unfortunately, the workers have been cold-shouldered by the society.

Real Work for the Real Chemists

The result is a separate society and almost uncontrolled publication, often of inordinate length, of a vast amount of loosely-knit material. Infinite injury is being done to the future of chemistry, as students are growing up as biochemists in no way sufficiently trained as laboratory workers and without grasp of physiology. The subject must suffer greatly, as a consequence, at no distant date. The real work is being done by real chemists—why then is the subject so divorced from the Chemical Society, that a large number of the workers have no connection with the body? Biochemistry, in fact, is becoming a soft option. In the public interest, the intervention of the Chemical Society is called for, to secure for true biochemistry the severe discipline that it demands.

Youth has always been fond of keeping pets: via biochemistry, it is now found that not only may a pseudo-scientific glamour be attached to the practice but much bold advertisement and good pay secured by its exercise. White-coated young maidens, by fondling guinea-pigs, rats and rabbits, find it easy to figure as engaged in biochemical research. Actually their work is akin to that of the milkmaids on a farm. Milkmaids are not likely to find solace in the Transactions of the Chemical Society.

The physical chemists, like the biochemists, are equally aloof from the parent society. They have been kept together under the aegis of the Faraday Society, which has far more cleverly organised its affairs than the Chemical. In its wordy publications, however, it has also shown no sense of proportion; perhaps it has been influenced by the unfortunate example set by the "Journal of Physical Chemistry."

A New Spirit Wanted

The last offender I will refer to is the Society of Chemical Industry. In large measure this is nothing but another Chemical Society. I had the pleasure, only a few days ago, at the opening meeting of the session, under the patronage of the engineering group, of listening to Dr. Bengough's first lecture on "The Corrosion of Metals," a purely academic inquiry into root principles of fundamental importance. Academic chemists were conspicuously absent, however. I had a similar experience, in giving an address to the Manchester Section of the Society of Chemical Industry, at the opening of the season on October 7th, on "The Origin of Visual Colour." The academic element from the University was again conspicuously absent. In Manchester, town and gown apparently do not mix. The £5,000 a year Professor I have asked for often has yet to be appointed there—he will necessarily be a man with some social outlook. What can the Chemical Society do in the provinces, if such be the condition of affairs? We have to introduce a new spirit into chemists—to humanise them and force them to think together and work together.

The society, in future, must be a complete "mix-up" of all sections—so that the would-be chemist may have fullest opportunity of understanding his science in all its applications. This was the policy I had ever before me during the twenty years (1875-95) when I had a controlling voice in the affairs of the society. My fifteen years' fellow secretary (J. M. Thomson) and I did our best to concentrate all chemistry in the society. Multiple publication was stopped by the rule that publication elsewhere was a bar to the appearance of a paper in the society's journal. I advisedly weaned chemists from the Royal Society; so much so, that excepting a highbrow or two, such as Dr. Russell or Professor H. B. Dixon, who sought cremation in its Transactions, no chemistry of any account was published by the society. Of late years, not a little of our chemists' best work has been buried in the Royal Society's Proceedings, partly because of the narrow-minded tyranny exercised in the Chemical Society's editorial department and, particularly, because the society has lacked the enterprise to illustrate papers to the required extent.

The Official Attitude

Pedantic rules about prepositions and nomenclature led me personally to withdraw my work from the society, because I would not have my English dictated to me by an editor without literary sense. Some will remember the amusing "But" tournament of Professor Patterson. The general official attitude has too long been of this order. When I went out of office in 1895, the society had all but complete control of chemistry; now it has no control whatever—no expressed ambition to guide and promote general progress. Official eyes have been and are hopelessly myopic. The society has no social coherence: this is a root cause of its difficulties. I can say now without affectation that what I did involved more than publishing papers—sympathetic personal contacts had to be established.

The society needs complete and drastic reform. The change from its early constitution to the present democratic form has been an entire failure; this was made by and on behalf of the younger men, who had imagined that they were over shadowed by their seniors. Now that the younger men are so fully represented and seniors are brushed aside, they are

no more vocal than they were; as much afraid as ever to speak out. They bow to a few seniors on account of their pockets. I am blankly told, when I protest, "As Professors X and Y hold the seals of appointment, we dare not speak against their views." The Council is more than twice the size it should be and entirely unrepresentative, except of one narrow interest—the purely academic—which apparently is incapable of managing its affairs, even to its own advantage. The Publication Committee is nothing short of a farce—far too large and too exclusively academic. Until publication is placed in the hands of a small authoritative body of assessors, acting with the editor and the officer and supported by a panel of referees, there will no health in the Journal.

General Apathy

Our protests have have had some effect. A heavy dose of Kruschen salts has evidently been given to the journal; bookshelves are beginning to have hopes but papers remain unreadable. Unfortunately, there is general apathy. The need of organising all our forces is in no way recognised. The virus disease of little-endism has so eaten into the vitals of the academic fraternity that few have the imagination to deal with the situation. Mr. Johnson and I—an entirely back number with no right to an opinion—have been allowed to appear in your columns. Professor Morgan has valiantly entered the lists in full presidential armour and shown up the financial weakness of the situation. Sir William Pope has been stirred to join in the fray and, following the Prime Minister's example, suggests a conference. Apart from these two valiant knights, no one seems inclined to contribute to the discussion. Real action has to be taken—either Gandhi or Germany might be followed. I would gladly threaten to commit suicide in the cause but I never should be missed. I suggest, therefore, that someone who is universally popular, say Professor Smithells, should be called upon—at least, to withhold all Salters' Grants for research. The D.S.I.R. and I.C.I. might copy Germany's equality example and refrain from incubating academic research; too much of the work they subsidise is wasted effort.

Really the canker goes far below the Chemical Society and begins in the University. We have lost the art of laboratory training; the average chemist turned out to-day is not worth his salt so far as his fingers are concerned; as to his head, that is non-existent as a thinking machine; he has only learnt by rote. This is the complaint I hear everywhere. Apart from the work of a few who are born chemists, the so-called research offered for publication, in pursuit of the Ph.D., for the most part, is work that should never have been undertaken and is seldom worthy of record beyond card catalogue length; nor has it educational value.

Physics is in a worse plight than is chemistry—more in need of a return to the ways of the past. To put chemistry straight, to put physics straight, however, we have to reconstruct the whole educational machine and make its discipline morally efficient. Even a worm will turn. The fact that a former President of the Board of Education, Lord Eustace Percy, is now denouncing the School Certificate examination is fair proof that our position is a serious one. If we allow the schools—and universities—to continue their present course of cram and commercial pot-hunting, intelligence and individuality will soon be educated out of our nation.

Clearly, there is a sufficient task before us, if we are to make chemists an united efficient body of workers, able to render the public service that will be demanded of them. The issue at stake is not the mere publication of a few papers. What we have to consider is "the makin's of a bloomin' soul" in the chemist.

Letters to the Editor

An Opening for British Plant

SIR,—According to the "Times" of October 21, the Egyptian Government will shortly invite tenders for the construction of a large hydro-electric plant to make use of the enormous head of water which will be available when the work of heightening the Aswan Dam, which is now in progress, is completed. The plant is to consist of four large turbines, each generating 40,000 kilowatts, and is to be erected on the western end of the 2,000-yard long barrage. It will be one of the most important works of public utility undertaken in Egypt in recent years, and will be financed by the Government entirely out of revenue.

The power generated is to be used in the first place for the manufacture of artificial manures, chiefly nitro-chalk. Plant for this purpose is to be erected later as the work on the power station proceeds for it is estimated that the latter will take more than four years to complete and the fertiliser plant only two. Egypt at present imports about 300,000 tons of fertilisers annually, and the local product is expected to be manufactured at a much lower cost. The factory is planned to provide about one-third of Egypt's present requirements. The remaining power is to be employed for irrigation.

British plant manufacturers ought to have a look in, but I doubt if they will.—Yours faithfully,

"BUY BRITISH."

German Paint Firms Merger

A MERGER was recently concluded between O. P. G. Wedekind and Co., the Altropac Farben G.m.b.H., the Chemieprodukte G.m.b.H., and the Nitrocellulose Varnish Sales Office of the I.G. Farbenindustrie A.G. The new company is named the Chemie-Farben G.m.b.H. of Berlin-Britz and will market not only the paint products of the firms joining the merger but in addition the merchandise of several other companies which includes Gustav Buchser A.G., Gebruder Pfanne G.m.b.H. and J. C. Schultze of Berlin-Britz. The purpose of the merger is reported to be for stimulation of domestic paint sales by extending the commercial and technical service facilities available to consumers.

A New British Chemical Standard

Cupro-Nickel "A"

BRITISH Chemical Standards announce a new non-ferrous standard cupro-nickel having the following percentage analysis:— Copper, 68.8; nickel, 30.08; silicon, 0.12; manganese, 0.89; iron, 0.05; magnesium, 0.027; carbon, 0.02 sulphur, 0.01; lead (not above), 0.01 and cobalt (not above), 0.01. This sample will serve as a standard for the analysis of cupro-nickel sheets and strip referred to in the British Standard Specification No. 374 (1930). It may be used also for checking the analysis of cupro-nickel alloys employed for condenser tubes, bullet envelopes, coinage, electrical rheostats and resistances, base metal thermo-couples, and domestic utensils. It is believed that this is the only standard of its kind issued in either Great Britain, the United States, or on the Continent, and it is therefore likely to be of international interest. As usual the standard turnings have been analysed by a number of chemists representing the different interests involved, *viz.*, independent analysts, railway chemists, cupro-nickel manufacturers and users.

The standard is issued in bottles containing 500 grams, 100 grams, and 50 grams, and each bottle is provided with a certificate showing the detailed analysis of each chemist together with an outline of the methods used. It is issued at a price which is estimated eventually to cover the cost and may be obtained from Ridsdale and Co., British Chemical Standards Headquarters, 3 Wilson Street, Middlesbrough, or from laboratory furnishers.

Hydrochloric Acid in Belgium

BELGIUM produces annually about 60,000 metric tons of hydrochloric acid as a by-product of sodium-sulphate manufacture. The largest producer is the Union Chemique Belge, with about 35,000 tons. The largest uses for this acid in Belgium are for metal pickling and gelatine manufacture. There is a steady export trade from Belgium in this acid, chiefly to the Netherlands, France and Germany. Figures covering exports for the last four years in metric tons are 1928, 7,776; 1929, 18,436 (7,059 tons to Germany); 1930, 8,023; 1931, 9,129. Of the 1931 shipments 6,223 tons went to Netherlands, 1,929 tons to France, and 800 tons to Germany.

Recent Progress in the Design of Metafilters

By J. A. PICKARD

IN the last filtration issue of THE CHEMICAL AGE, the first description was published of a new type of Metafilter for use in varnish manufacture. Since that date, this varnish filter has given results of a quality exceeding anything that had been expected. Further filters have been constructed, and the British rights for this process of filtration have been acquired by one of the largest British varnish manufacturing concerns. So effective has the operation of the filter proved, that both settling and centrifuging have been practically superseded by its use.

Several new types of Metafilters have been introduced during the past year, the most important being possibly the filter for transformer and switch oils. This filter is illustrated in Fig. 1, and is employed for the restoration of oils used for cooling and insulating transformers, and for arc quenching

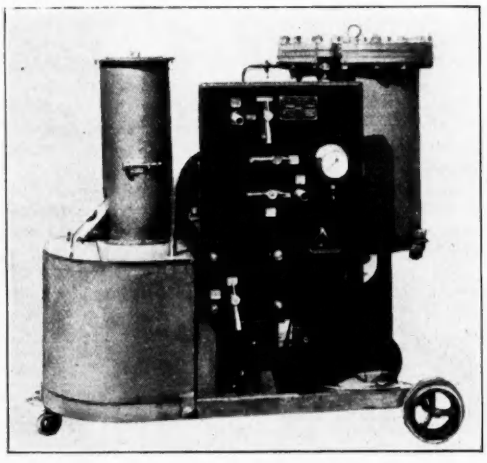


Fig. 1. Portable Transformer Oil Filter.

in switches, to their original insulating efficiency. During the operation of the transformers and switches the oils in use undergo contamination from the formation of sludge and colloidal carbon, and by the accidental introduction of water vapour. All this means that the breakdown voltage can easily be brought as low as 5 kilo-volts instead of the 40 kilo-volts usually demanded. The Metafilter is successful in increasing the breakdown voltage from any low figure up to 70 kilo-volts or even higher in one step. The previously employed apparatus for this duty, mainly centrifuges, blotting paper filter presses and other filters, have not been able to secure so high a degree of efficiency, and at the same time have suffered from the considerable drawback of having to use very large quantities of power for the result achieved. The Metafilter for an output of 300 gallons per hour employs only 1½ h.p., whereas previously something like 70 h.p. was needed for a comparable result. The advantage of the Metafilter does not lie solely in the saving of power, however, but in view of the fact that the purification is accomplished without heating the oil, all those factors of disintegration which arise from the action of heat are avoided. As certain of the impurities are slightly soluble in hot oil but insoluble in cold oil, it will be plain that a higher degree of purification will be accomplished by a filter operating in the cold, than one for which oil must be heated.

Portable Metafilter for Electrical Use

The filter illustrated is a portable model with an output of 100 gallons per hour, but stationary plants of much higher output have been supplied also. In the illustration the filter is shown on the right hand side and consists of a number of Metafilter ring packs. Two pumps are placed centrally on the trolley, both driven by the same ¾ h.p. motor. The first pump picks up the oil to be purified and delivers it to the mixing tank on the left, in which the depth of oil is controlled by a ball valve. In this tank the oil is continuously mixed with an amount of Metasil (filter bed), suited to its requirements. This is accomplished by means of the Metasil feed, which is driven by the motor and delivers the Metasil as a dry powder into the oil, the rate of addition being easily regulated by a lever and scale. The mixing tank contains a mixing paddle, and the mixture is drawn from the tank by the other pump and delivered to the filter. Suitable connections are made to enable the first runnings to be circulated, after which the filtered oil is delivered to the desired situation. All operations are carried out from the front of the machine, the position of the various handles being clearly indicated on the instrument board. To clean and empty the filter is a matter of a few minutes only. All that is necessary is to drain away the oil and then, after opening the swing out bottom of the filter, pump a very small quantity of oil in the reverse direction. This dislodges the whole of the filter bed and accumulated residue, which is collected in a tray or barrow, and the filter is then ready to restart operations.

Other types of Metafilters which have been introduced, will prove of considerable interest to mineral water manufacturers, who have already installed a number of these plants both for sterilising and clarifying the water and for conferring brilliancy upon the syrups and finished beverages. The general design of the water filter has been improved and matters of detail have been very carefully thought out. The latest model is shown in Fig. 2. It is claimed that this filter for its output is more compact than any other, and that the quality of the filtrate is unsurpassed.

Metafilters for Syrup Flavours

The filters for syrups have many points of resemblance to the beer filters, but instead of using strip packs, ring filtering packs are preferred. Such filters are intended to deal with such materials as ginger syrup, and have an output of 60 gallons per hour. The filter is mounted on a carriage with wheels for ready portability, and consists in a base, filter packs, dome, and pump. The base is constructed of tinned gunmetal, and carries both the unfiltered syrup inlet and the filtered syrup outlet. The packs themselves are made of monel metal rings with a separation of 0.0015 inch, and their number and length depends upon the output required. The dome of the filter is recommended in monel metal, but tinned copper is an alternative preferred by some users.

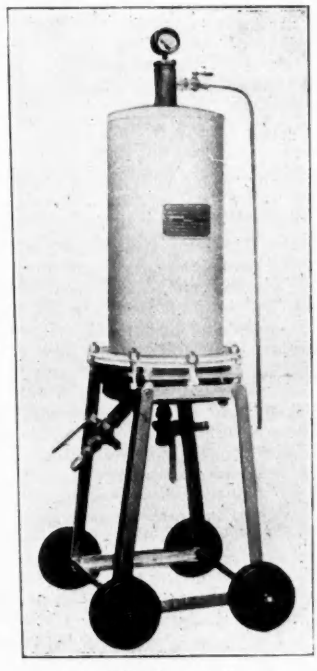


Fig. 2. Metafilter for Syrups.

The method of operation is similar to that of the beer and water filters. The correct amount of Metasil to form the filter bed is mixed with a certain amount of unfiltered liquid and poured into the filter through the dome. The pump is then set to work and the liquid forced through the filter; the first runnings are returned for refiltering, and the filtration proceeds until everything has passed through. The operation of these filters is extremely rapid as well as very effective, and the cleaning is a matter of great simplicity. It can only be a matter of time before the dirty, slow, and very inefficient bag filters which are still in use are entirely replaced.

Purification and Filtration of Water

By W. J. M. COOK

This article is a contribution from the Research Department of the Neckar Water Softener Co., Ltd., London, who are specialists in water treatment.

As in other industries, there are very few sections of the chemical industry which are not dependent upon water, either for process work or for steam raising. Furthermore, it is generally of paramount importance that the water should be of a high standard of purity. For processes requiring only a small quantity of water the town supply is very convenient though sometimes rather costly, particularly where treatment for the removal of the hardness is essential, as this involves additional expense. Where a considerable amount of water is used, the cost of town's water often becomes prohibitive, and an alternative supply has to be found. It is in connection with such supplies that this article is chiefly concerned.

Source and Condition of Supply

Available sources of water may include canal, river, stream or brook, pond, well or borehole. Occasionally, the prospective supply is an admixture of two or more waters. In very few cases is the water from any of the afore-mentioned sources suitable for use without some preliminary treatment. Such water, in all probability containing suspended matter, colour, hardness, odour or bacteria, would undoubtedly be condemned were it not for the possibilities afforded by the various methods of treatment available.

The impurities found in canal and river water are generally very varied and often in fluctuating amounts. In addition to hardness, practically all waters from these sources contain organic and inorganic matter in suspension and many species of biological impurities. Due to the movement of the water, and this particularly where there is shipping, the solid matter is never allowed to settle. Where a river is affected by tidal influence, the hardness and saline matter varies considerably between high and low tide. Providing contamination is not taking place from some extraneous source, such as drainage, the water from a well or borehole is generally of a purer nature than that from canal or river. Scale-forming or hardness salts often occur in considerable amount; inorganic solid matter, in the form of fine particles of clay and sand, is sometimes present; and occasionally organic matter in solution and suspension is found in amounts which merit observation. Bacteriologically, well and borehole waters are purer than most other natural supplies, due to the filtering effect of the numerous strata through which they flow. This is more pronounced where the borehole is deep, as the shallow well is liable to contamination by surface drainage. Unfortunately, during its passage through the different strata, the water gains mineralogically, resulting in such waters being frequently very hard. The degree and type of hardness are governed, to some extent, by the locality and depth of the well or borehole.

The Sand Filter

Where it is merely a question of removing suspended matter the sand filter, either gravity or pressure type, is employed. The larger particles of solid matter can be removed by a screen or strainer; but this method will not suffice when the water contains finely divided matter in suspension. Fig. 1 shows a typical Neckar pressure type sand filter which has the advantage over the gravity type in that it can be installed in the pressure main. The container is a riveted cylindrical tank with dished ends and is designed and constructed to withstand a pressure of 100 lb. per sq. inch. Cleansing facilities include provision for compressed air, a steam inlet and ejector being provided for cases where compressed air is not available. Pressure gauges are installed at the inlet and outlet of the filter to indicate when cleansing is required. Specially treated fine sand, resting upon two grades of quartz chippings, comprises the filtering medium, whilst a bed of concrete fills the bottom of the cylinder. Situated midway in the first layer of quartz is a pipe manifold so constructed as to ensure an even withdrawal of water through the bed when the filter is in service, and a uniform distribution of water and air when the bed is being backwashed. The numerous holes in each lateral of the manifold are fitted with special wire-gauze strainers which further preclude the possibility of sand being drawn through the treated water outlet.

The unfiltered water enters as shown, gently overflows from the bell mouth pipe, and permeates downwards through the bed of sand and quartz to be collected by the numerous strainers, and delivered, perfectly free, from all suspended matter. This continues until the interstices beween the grains of sand have become partly choked with the arrested solid matter, when the pressure drop through the bed increases and indicates that the filter requires cleansing. Cleansing is done by passing air through the bed and reversing the flow of water; this is the process of backwashing. The compressed air lifts the bed, which tends to pack due to the continual flow of water downwards, at the same time agitating the sand and loosening the trapped impurities. The wash water, which follows the air, floats these solid particles to the top of the filter, whence it passes, via the bell mouth, to the drain. The backwashing cycle depends upon the condition of the crude water and the amount being treated. The whole operation occupies very little time and is comparatively simple to perform.

The sand filter is capable of retaining solid matter in a fine state of division. Very often, however, the solid matter is so firmly dispersed that it is akin to the colloidal state and will pass through the finest sand. This type of suspension

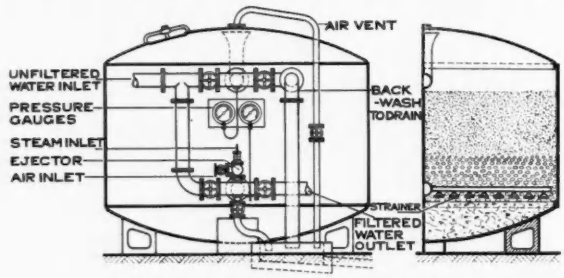


Fig. 1.—Neckar Pressure Type Sand Filter.

gives rise to after-precipitation which may have serious consequences and, therefore, has to be removed. In such cases, the treatment is supplemented, and filtration is preceded by a chemical treatment known as coagulation.

Coagulation and Filtration

Coagulation is effected by the reaction between aluminium sulphate and an alkali. A bulky, flocculent, precipitate of aluminium hydroxide is produced, coalescing and carrying down mechanically with it the fine matter in suspension. In addition it removes a great number of micro-organisms present in all probability, and much dissolved organic matter to the presence of which colour may be due, is carried down. Followed by a sand filter, the effluent from the combined treatment is clear and bright, practically free from any colour which the crude water may have contained, with the number of bacteria greatly reduced. It is of the utmost importance that the amounts of alkali and aluminium sulphate should be regulated so that the treated water is free from any excess of the latter. In aqueous solution aluminium sulphate reacts acid and it is, therefore, advisable to adjust the chemical addition so that the treated water has a *pH* value not less than 8 to 8.5.

Fig. 2 illustrates the method devised by the Neckar Water Softener Co., Ltd., for the treatment of water with a coagulant, not necessarily confined to aluminium sulphate. The installation consists of (1) the water apportioning apparatus, which divides the crude water supply into parts of 90 and 10 irrespective of rate of flow, and (2) the chemical distributor which supplies soda-ash solution and aluminium sulphate solution in the exact amounts required and pro rata to the rate of flow.

The 90 per cent. stream of water from the apportioning apparatus is fed to the reaction tank, whilst the remaining 10 per cent. is diverted, first to the chemical distributor, and thence to the reaction tank. The distributor consists of a rectangular tank, subdivided into three compartments, one of which is lead lined if aluminium sulphate is the coagulant employed. In the centre compartment are two buckets free to oscillate on a spindle which also extends across the division on either side, and to which are attached two scoops, one in each section. These sections contain the soda-ash and coagulant solutions, a constant level being maintained by means of a float in order that the scoops shall always be immersed. The 10 per cent. stream of water fills each of the buckets in the middle compartment alternately, the weight of the full bucket causing it to tip and empty its contents whilst the second bucket receives the stream of water. Thus, as the buckets tip, one scoopful of chemical is delivered to a small compartment in the chemical reservoir, partitioned off from the bulk of the solution. The scoops are so arranged that, with the tip of one bucket, the alkali is delivered, and, with the tip of the other bucket, aluminium sulphate is delivered. From the chemical distributor the solutions are delivered direct to the reaction tank, to which the water emptied from the buckets at each tip is also led. The reactions occur, the coagula settle out and the treated water is pumped to the sand filter which may be of gravity or pressure type.

With this installation a water may be treated with the correct amounts of chemical, irrespective of fluctuating loads or speed of flow. To adjust the amounts of chemical in the first instance, the scoops can be altered to collect and deliver a larger volume of solution, they can be adjusted to tip more frequently, or the concentration of the solutions can be increased or decreased. The whole installation is soundly designed and strong in construction, there being no delicate mechanism of any description, and therefore, minimum liability of the apparatus becoming inoperative.

The presence of excessive hardness in a water is injurious to many processes connected with the chemical industry, whilst for steam raising, which probably finds application in every section of the industry, a hard water cannot be tolerated. The use of hard water for boiler feed purposes results in precipitation of hardness salts in the boiler, giving rise to priming which, in turn, produces dirty steam. Such steam can have far-reaching ill effects.

Some processes are more exacting than others and require a water entirely free from salts of calcium and magnesium. The method of treatment in this case is by zeolite. The passage of water of any degree of hardness through a Neckar base exchange plant results in a water entirely free from hardness salts. Many plants of this type have been supplied for use in the dyeing industry, since it has been found that waters high in hardness, particularly that due to bicarbonates of calcium and magnesium, do not produce a uniformly-coloured material. This method of treatment, is, however, not to be recommended for boiler feed purposes as the treated water contains bicarbonate of soda, which concentrates in the boiler, producing high alkalinity, and necessitating wasteful blowing down.

A good general purpose water is obtained by the lime and soda method of softening. This form of treatment, which reduces the hardness to approximately 3° British, when

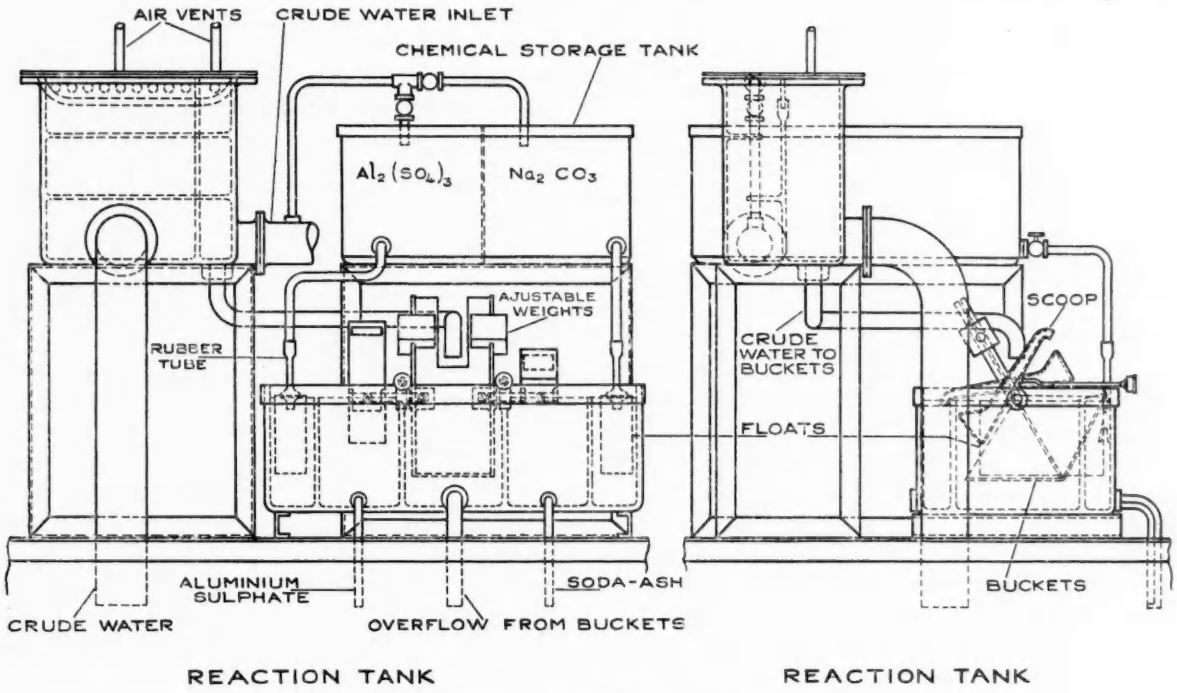


Fig. 2.—Arrangement of Neckar Water Apportioning Apparatus and Chemical Distributor.

applied at normal temperature, has the advantage over the zeolite method in that it appreciably reduces colour and bacteria content also the quantity of dissolved solids, whilst the precipitated hardness carries down suspended matter. In the Neckar cold process lime and soda plant, the lime is added in the form of saturated lime water, and the soda as soda-ash solution, the latter by means of the tipper device previously described.

This installation consists of a vertical cylindrical tank in which the reactions occur, the precipitates formed falling into the conical bottom from which they are removed by periodic opening and closing of a sluice cock. At the side of the main tank, the Neckar closed type saturator is situated, this being the latest development in the lime-soda type of plant, having the advantage over former types of saturator in that it can be charged at ground level without pumping. A further refinement is the Neckar patent hardness regulator which is invaluable where waters of fluctuating hardness are to be treated. The soda-ash solution storage tank, the tipper device, and the hardness regulator, are erected on the top of the main tank. The crude water supply enters the hardness regulator, the pointer of which is set to the calibration corresponding to the temporary hardness of the water being treated. Inside the regulator, the incoming crude water is

divided into three streams irrespective of rate of flow. The first passes to the lime saturator and displaces an equivalent volume of saturated lime water; the second passes to the tipper and brings about the addition of soda-ash in the manner already described; the third, and bulk of the water, enters a tube situated in the centre of the tank and known as the mixing tube. Into this tube the correctly apportioned quantities of lime and soda ash are led, meeting the crude water stream from the hardness regulator. Intimate mixing takes place, the chemical reactions occur and the precipitates formed are deposited in the conical base of the tank. The softened water rises around the outside of the mixing tube, percolates through a filter, incorporated in the softening tank, or as a separate unit, and passes out to the storage tank.

Treatment for Boiler Feed Purposes

The treatment of water for boiler-feed purposes demands very special attention. The Neckar Water Softener Co., Ltd., after many years of investigation, has perfected a system which enables them to give the very stringent guarantee of keeping boiler surfaces entirely free from scale. Usually only one chemical is required, namely soda ash, so that the cost of treatment is exceedingly small. The fact that bicarbonate of calcium and magnesium are deposited upon heating is utilised and the chemical treatment is required only for those salts which are not precipitated by heat, referred to as permanent hardness. An amount of soda ash slightly in excess of the theoretical quantity is added to precipitate the permanent hardness. This slight excess enters the boiler in the feed water and is hydrolysed to caustic soda, the degree of hydrolysis depending upon the boiler pressure. The hydrolysis is about 40 per cent. to 60 per cent. for normal boiler pressures.

From a low point on the boiler, usually the existing blow-off cock, a ¾ in. pipe is run, vertically, to join a common bus main which collects the returns from other boilers. This main pipe deposits in the softener the small percentage of boiler water which is forced through the ¾ in. pipe, due to the boiler pressure. The boiler water contains caustic soda, which assists in the softening treatment, together with sludge, formed by the residual 1½-2° of temporary hardness which remains in the treated water so that the sludge is deposited in the softener and prevented from accumulaing in the boiler. The amount of return water is controlled as required by means of a regulating cock. This Neckar continuous return system is patented in all countries and installed throughout the United Kingdom and the Continent.

The Hot Process System

The Neckar hot process softener works in conjunction with the continuous return device. The softening tank (including wood wool filter) is the same in design as the lime-soda installation, and the chemical-dosing gear, including the water-apportioning apparatus, the same as that described for the treatment of water by coagulation, except that the tipper contains only a single scoop. A temperature of about 175° F. is maintained in the softener as the incoming crude water is heated by means of a tray type pre-heater utilising exhaust steam which would otherwise be wasted. The concentration of soluble salts in the boiler, producing density and tendency towards priming, is kept within safe limits by intercepting the continuous return between the boilers and the softener with a special installation known as a deconcentrator. Prior to the introduction of the deconcentrator, concentration of soluble salts was countered by discharging a proportion of the boiler water to waste, a costly procedure involving loss of heat and water. With a deconcentrator 90 per cent. of the heat, otherwise lost by direct blowing down, is regained in the following manner. A percentage of the continuous return from the boiler, representing the amount of water which must be removed to keep the boiler water correctly conditioned with regard to alkalinity and density, first enters the expansion chamber of the deconcentrator. Here it is cooled to atmospheric boiling point, releasing heat and evaporating some of the water as steam, which condenses and enters the softener. The remainder of this portion of the boiler water imparts its heat to incoming crude water and passes to drain.

The following analysis will serve to illustrate the value of the hot process softener with continuous return.

Temporary Hardness	0.35	degrees	British.
Permanent ,, ...	3.15	,,	,,
Total ,, ...	3.5	,,	,,
Total solids in solution	5.16	grs. per	gal.
pH Value	5.9		

The above water, though comparatively pure mineralogically, owing to its being derived from a peaty source, is definitely on the acid side of neutrality and would be unsafe for boiler feed water for this reason alone. In addition, however, the water contains 3½° of hardness, of which 2½° is due to calcium sulphate. Owing to the decreasing solubility of this salt at boiler temperature it is precipitated and forms hard scale on the boiler tubes, therefore causing heat losses and necessitating increased fuel for steam raising. Treatment by the Neckar hot process system of combined feed water treatment and boiler water conditioning, rendered this water suitable for use and gave results fully in accordance with the guarantee. The cost of treatment using soda ash, the only chemical required, was 0.5d. per 1,000 gallons.

Some New Uses for Anhydrite

Research Developments in Canada

CANADA'S large deposits of anhydrite may shortly prove to be a valuable asset to the country. Hitherto these deposits have been regarded with disfavour by gypsum quarry operators, because of the labour and expense involved in sorting the anhydrite from the gypsum, with which it is closely associated and on which it acts as an adulterant. Recent researches conducted on anhdrite by the Department of Mines, however, have been productive of highly encouraging results. This work has been directed largely toward an endeavour to use the substance in the manufacture of commercial plasters. Plasters from anhydrite have been produced which compare favourably, both in respect to "setting" qualities and in tensile strength, to many of the better grades of gypsum plasters now on the market.

Anhydrite plasters have a greater density than those of gypsum, are strong, are easily worked, and do not require calcination. They can also be used as a final coat on walls, on which, at present, only a lime plaster is used for finishing. Many patents have been filed in Canada, the United States and in Europe, in which anhydrite forms the base for plasters. Some 40,000 tons of anhydrite are shipped from Nova Scotia annually to the southern areas of the United States, where it is used principally as a fertiliser. Large tonnages of the mineral are also used in European countries in the manufacture of ammonium sulphate for fertiliser purposes and in the manufacture of cement and sulphuric acid. Recent investigations in the United States and elsewhere have demonstrated that it is possible to use as much as 50 per cent. of anhydrite with gypsum as a retarder in Portland cement. Much intensive research work still remains to be done, both by the Canadian Department of Mines and by other research organisations. This, it is felt, will eventually lead to the development of new uses for the substance, with a consequent fairly extensive development of the now practically dormant deposits.

Norwegian Cod-Liver Oil Exports

EXPORTS of cod-liver oil during the first six months of 1932 increased about 25 per cent. as compared with the corresponding period of last year, amounting to 05,739 hectolitres and 71,060 respectively, of which steamed medicinal oil totalled 44,092 hectolitres and 36,405 in the order named. Of the 1932 shipments of the steamed medicinal oil, for which figures are available only, the United States took 12,500 hectolitres, as compared with 0,912 in the first half 1931, exports to Germany also increasing to 4,886 hectolitres from 2,703, and to Great Britain to 10,361 hectolitres from 9,990. Although the total 1932 cod catch was approximately 10,000,000 in excess of the 1931 catch, it compares less favourably with the yearly average for the last 15 years (1918-1932) amounting to 54,118,000. The record catch occurred in 1926, when nearly 90 million were landed.

Kieselguhr as a Filtering Medium

By S. HEIM

KIESELGHUR has been used as a filtering medium ever since the kieselguhr industry has been in existence, though it has attained its present importance only during recent years. Kieselguhr was originaly used in combination with suitable binding materials, thus forming filtering media and was initially employed for the purpose of obtaining drinking water free from bacteria. Even at the present time such filtering media are in use, as in the case of the Berkefeld filter. Filtration by means of these porous filtering media, however, is too slow; consequently, unless plants on a very large scale are in operation the speed of filtration is low. As a result, ever increasing use has been made of kieselguhr in the untreated state, or in the form of a calcined powder, the liquid, in which the kieselguhr is suspended in certain proportions being filtered through a filtering cloth.

Kieselguhr, which is largely composed of diatomaceous, hollow particles of microscopic size, has the propery of absorbing oil suspended matter in turbid solutions to be filtered. The success of this process of purification lies in the fact that liquids which often only after filtration become suitable for further treatment are obtained in a clear state and above all, can be better preserved. For filtration purposes both crude and finely-ground calcined kieselguhr is used. The best kieselguhr is pure white, free from iron impurities, and it is then capable of ensuring the highest filtering capacity. Such a white kieselguhr, technically free from soluble iron, has a filtering capacity, as proved in practice, five times as great as that of an ordinary crude or calcined earth. Only this rapid-filtering kieselguhr, therefore, should be used in all cases, since it provides the greatset advantages in all kinds of filtration.

Speed in Filtration

The chief advantages are the considerably speedier filtrathan is the case when ordinary kieselguhr is used, the production of exceptionally clear, transparent liquors and appreciable saving in filtering cloth, labour costs, etc.

The improvement in technique, the endeavours to rationalise industry and the preparation of better products have led to the use of kieselguhr in manifold ways as a filtering medium. In particular, the sugar industry was one of the first to recognise the advantages of kieselguhr, and in the last few years has been making use in continually increasing degree of the best, rapid-filtering kieselguhr, especially for the viscous liquors. By means of filtration with kieselguhr a whiter and better crystallised, and accordingly more saleable and higher quality sugar is obtained. Rapid-filtering kieselguhr under the trade-name of "Filter-guhr," is now sold in a high state of purity, being practically insoluble even in acids, and free from organic matter and acid-soluble iron. Due to its fineness and low specific gravity, it holds up well in suspension in juice or syrup, and its microscopic particles present a great surface for the entangling of insoluble matter.

When "Filter-guhr" is deposited on filter-press cloth in a thin layer, the surface thus provided contains pores which are much smaller than the openings of the finest fabric. This makes it possible to remove the finest insoluble matter from the liquid undergoing treatment, and incidentally enables the use of cloth of cheaper quality. Its great advantage, however, is that it greatly increases the rate of flow, while giving porous cakes and brilliant filtrates.

"Filter-guhr" (of which there are several grades, to be used according to the purpose in view) has responded to exacting tests, both in the laboratory and on the large scale. It has been proved to have qualities superior to the ordinary grades in use in the sugar industry.

In the beet sugar factory a small addition of "Filter-guhr" at an early stage in the process proves of great assistance. One should commence with the addition of about ¼ kg. per sq. metre (about ½ lb. per 10 sq. ft.) of filtering surface at the second carbonation. This both hastens filtration and lengthens the life of the presses. In addition, the scums are no longer slimy, but firm and dry, so that the cakes are detached readily on unpacking the presses. In thick-juice filtration the "Filter-guhr" should be added continuously, not intermittently. In filter-press work, some of the thick-juice diluted to 40 to 50° Brix (say 2 or 3 times the contents of the press) are incorporated in a mixer with sufficient "Filter-guhr" to provide a layer 2 mm. thick. One should use for this about ¼ kg. per sq. metre (about ½ lb. per 10 sq. ft.) of filtering surface. After wetting the cloths of the press by pumping hot water through them, the contents of the mixer are allowed to run through under low pressure; then having added ½ to 1 kg. of "Filter-guhr" per 1,000 litres (5 to 10 lb. per 1,000 gal.) to the thick-juice, and heated it to a suitable temperature, it is pumped through the pre-coated press.

Use in Gravity Filters

In filtration through gravity filters, the rate of flow is particularly facilitated, and the bags remain soft for a longer time, besides being more readily cleaned. But whether presses or bag filters are in use, it is often possible to filter five times more thick-juice than without its addition, and thus realise considerable economy in time, labour and cloth. In the treatment of thick-juice by activated carbon, by using "Filter-guhr" in conjunction with it, as is now being done largely in many white sugar factories, considerable economy in this costly decolorising material may be effected.

Kieselguhr has long been used in the refinery for the clarification of its liquors, and its use is now universal in sugar-houses of the United States. Its method of application is simply to mix a small amount, only 0.1 to 0.25 per cent. in the case of "Filter-guhr," with the liquor, and, after heating, to pump this through pre-coated presses. This method of working, even in the case of very gummy raw cane sugar, will give a brilliant filtrate.

For filtering fruit juices, honey, etc., the chemically pure neutral kieselguhr is steadily gaining in importance. When filtered through kieselguhr fruit juices and other liquors become more wholesome and, above all, more capable of preservation, for kieselguhr keeps back all injurious fermentation basteria. Beverages, such as wines, vinegar and beer, can also, with advantage, be filtered through kieselguhr. Kieselguhr has also become an indispensable medium of filtration in the production of fats and oils.

Fused Alumina Refractories

A New Material for Pyrometer Tubes

SUCCESS has now attended efforts to produce refractory bodies by fusing 99.8 per cent. alumina oxide by the usual ceramic methods, the sphere of utility of this oxide being thereby extended to all those purposes for which technical porcelain or certain natural forms of alumina (*e.g.* corundum) had hitherto been utilised. In marked contrast to other ceramic masses, the production of refractory masses of alumina is not accompanied by transition through a glassy state for the crystalline structure is maintained unchanged at all stages. This phenomenon accounts to some extent for the high compression strength and density as well as the hardness which corresponds to that of natural corundum. Another remarkable feature is the very high heat conductivity which amounts at room temperature to 18 times that of technical porcelain and approaches that of German silver and other alloys.

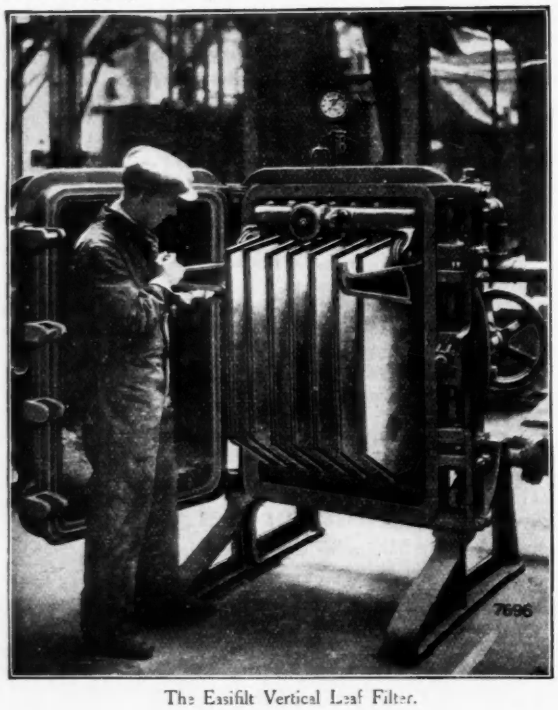
As recently announced by H. Gerdien ("Chem.-Zeitung," October 8, 1932, p. 803) the material is now commercially available, under the designation of "sintercorund," for the manufacture of apparatus destined for exposure to a maximum temperature of nearly 1,800° C., including pyrometer tubes. Sintercorund is completely resistant to 6 hours contact with boiling 10-30 per cent. caustic soda and to 24 hours treatment with superheated steam (150 atmos.). It possesses relatively good resistance to fused sodium peroxide, sodium hydroxide, and sodium carbonate, as well as towards molten aluminium manganese, iron and many metal alloys. Hydrofluoric acid vapours have no action on sintercorund, which is also said to resist the destructive action of blast furnace slag more successfully than any other refractory hitherto employed for crucible construction.

Leaf Filters for High-Speed Clarification

Dealing with 8,000 Gallons of Solvent per Hour

DURING the past year Manlove, Alliott and Co, Ltd., have been devoting themselves to the perfection of small and medium size leaf filters for solvent and high speed clarification purposes. "Easifilt" filters have now been made in sizes capable of dealing with 8,000 to 9,000 gal. per hour of solvent. In this type of filter, one of the main features is the ease with which access can be had to the whole of the filter surface for purposes of inspection and cleaning, and the facility with which the cake may be discharged.

This apparatus consists of a cast iron outer casing divided into a pair of clams, which are hinged to each other along a vertical line and opening outwards. The filter leaves, in the more general form of construction, are attached to a common header which normally is entirely within the filter, but may be run out clear of the fixed half of the filter body, so that the cake may be scraped down directly into a discharge truck. The leaves consist ordinarily of strong iron wire frames carrying a heavy iron wire drainage surface, covered



The Easifilt Vertical Leaf Filter.

with woven Monel metal wire cloth. In order to permit the filter to be used at the very high rates of flow which are obtained, the leaves are provided with two outlets, one at the top of the leaf, and the other drawing from the bottom of the leaf, through a tube carried internally in the centre of the leaf itself. These outlets joint into separate compartments of the header, so that the advantage of both top and bottom discharge may be had in combination and separately. This is particularly valuable inasmuch as air locks in the filter are minimised and, at the end of the operation, it is possible to drain out the interior of the leaves very thoroughly by the bottom discharge arrangement.

New features of this filter are the patented internal liners for distributing the flow, which have added something like 50 per cent to its capacity in handling dirty solvent at dry cleaning works. These liners even out the flow of the incoming liquid and distribute it equally across the whole width of the filter on each side, so that it flows between the leaves in a direction parallel to them. This ensures an even cake being formed and also prevents any direct contact of air with the cake, should any leak into the suction line.

Among other products, this firm has also been developing a cheaper type of filter, designed to work at pressures up to 60 lb. per sq. in. This "Filtrall" filter is also a leaf type, the leaves being arranged within a cylindrical vessel with the cake discharge sump beneath them. Access is had to the leaves through a cover at the top of the filter, and a door in the sump. The "Easifilt" may also be had in a form having a cake sump beneath a set of fixed leaves. This is an excellent type where the filter has to be built to withstand corrosive liquids, provision being made for draining the cake sump by filtering the residual liquids that are in it before the outer case is opened.

The Choice of a Filter Press

The firm also continues to give considerable attention to chamber and frame filters, and these are capable of meeting a very wide variety of needs. Particular care is given to the finish of the plates and frames, from which all sharp edges are most carefully removed, while particular care is taken to ensure that all surfaces in contact with the cloths are particularly clean and smooth. With recessed plates an easy slope leads from the filter surface to the joint surface, and eases the strain on the cloth. The materials of construction are usually cast iron or wood, though aluminium and bronze filters are also constructed. For wood filters pitch pine, oak and teak are the usual materials of construction, and much care is taken to see that the timber is properly seasoned and free from knocks and shakes. For simple filtration problems where no washing is required, users are recommended to adopt a recessed type of press, except for wooden constructions, where a plate and frame type is almost always employed for mechanical reasons. The plate and frame press is also strongly advocated where washing is required. This type is also particularly suited where thin cloths have to be used or where the materials being filtered are apt to make the cloths tender, since less strain is placed on the cloth than the flat plate.

An Inexpensive Plate and Frame Press

Manlove, Alliott and Co. are now turning out an inexpensive type of plate and frame press with the various passages formed in internal eyes. They are also constructing the somewhat more costly type of filter press with external lugs, which is often preferred on account of the greater ease with which the joints may be made. In the latter type the joints on the passages may be made by means of cloth sleeves or rubber rings on the outside lugs, and no holes whatever need to be cut in the cloths, which are consequently more easy to prepare and to keep in position. The system of washing adopted consists in bringing the wash water through these continuous ports to each "wash inlet" plate, where it flows through a port to the filter surface grooves under the cloth and passes outwards through the cloth and cake, and through the opposite cloth to each intermediate "wash outlet" leaf. Air outlets are provided so that air can be entirely freed from the filter surface, in order that wash water may have access all over the filter surface. Where very special results are required, frames are provided with a lug on the wash outlet side, designed to prevent leakage of wash water round the edges of the cake. The escaping wash water is generally taken through an enclosed outlet passage. The filtrate may be taken away through taps, or into an enclosed outlet passage if it is desired to lift it to a higher floor.

A Variety of Closing Gears

This firm is also in a position to supply plates with internal heating and cooling arrangements, and a variety of closing gears ranging from the simple centre screw type (for small presses where high pressures are not required), or a spur wheel and ratchet pinion gear (for higher prssures in larger presses), to toggle lever and hydraulic closing devices (where very large presses or high pressures are in use). Filters may be constructed for use with pressures up to 400 lb. per sq. in. The firm has an experimental department adequately supplied with small scale apparatus of various sizes and types, including a laboratory type "Easifilt" and various recessed plate, or plate and frame presses.

Filtration Units with Novel Features

Typical Applications of the Vokes Filter

FILTERS in different forms are now accepted as an established industrial necessity. With modern developments and the continual improvement in industrial production, greater degrees of refinement become necessary and to obtain the present-day high standard of refinement of modern products, the highest degree of filtration is essential. The experience gained by C. G. Vokes, Ltd., who are pioneers in filtration in this country, enables them to provide a high efficiency installation for all such requirements. The filtering media used in these filters are varied to suit specific requirements, and experience in ascertaining the properties of various commercial materials for filtration purposes of all kinds places them in a unique position to deal with filtration, however unusual the problem may be.

Vokes filters are not confined to the filtration of air, but are constructed for reclaiming waste oil or the cleaning of paraffin (enabling it to be used over and over again for washing purposes), the filtering of juices and acids, and numerous liquids, to say nothing of the increasing plant required for dust reclaiming processes in tobacco factories, sugar refineries, white lead plant and other industries where valuable dust can otherwise escape from the building into the atmosphere.

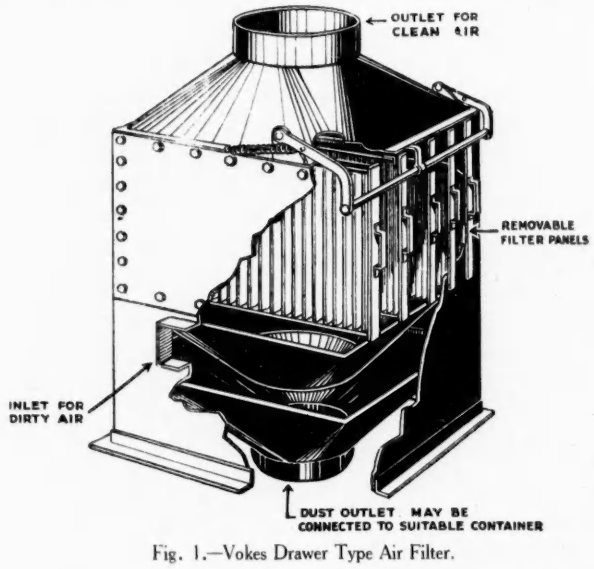


Fig. 1.—Vokes Drawer Type Air Filter.

By the assistance rendered them by members of the Factory Inspection Department, C. G. Vokes, Ltd., are now in a position to place filters in public service which are recognised installations for overcoming the dangers of silicosis. In designing apparatus for sand blasting dust recovery, special attention has been given to this point. It will be understood, however, that a filtering medium which is suitable for reclaiming the dust used in a sand blasting plant will be entirely unsuitable for reclaiming sugar dust in a sugar refinery, for example, the latter having to handle a sticky substance requiring special treatment. In this connection a few illustrations indicating examples of applications of Vokes filters in modern industry will be of interest.

A compact form of air filter of the drawer type is shown in Fig. 1. The air passes in through the rectangular duct and under the internal cone where the heavy particles of dust are automatically thrown off into the dust exit at the base and thence to the five screens and out through the outlet at the top of the filter. The screens referred to are in the form of drawers, each drawer being fitted with a handle to enable it to be slid in and out for cleaning purposes when required. In operation, however, the locking bar in front of the filter has three positions. The normal closed position is the lowest in which the bar is held tightly against the drawers by means of a spring, thus holding the drawers rigidly in position during their filtering operation. These filters may be supplied with dry fabric screens or oil-wetted screens according to the nature of their requirements. Periodically, say every few hours or so, the bar should be lifted and hung on to the hook provided for the purpose. This lifted position will give a clearance between the drawers and the bar of about $\frac{3}{4}$ in., and this clearance enables each drawer to be taken in turn and pulled back against the bar and slammed forward again to shake off the accumulated dust. When it becomes necessary to remove the drawers for replacement or further cleaning, the bar can be moved right over to its uppermost position, when the drawers can easily be withdrawn and replaced. This filter is of particularly compact form and may be supplied either for air cleaning or dust recovery, the filtering medium used being specially selected for the particular purpose for which the filter is required.

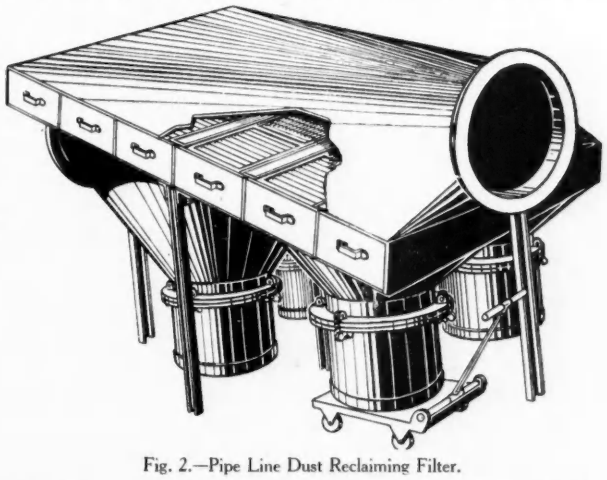


Fig. 2.—Pipe Line Dust Reclaiming Filter.

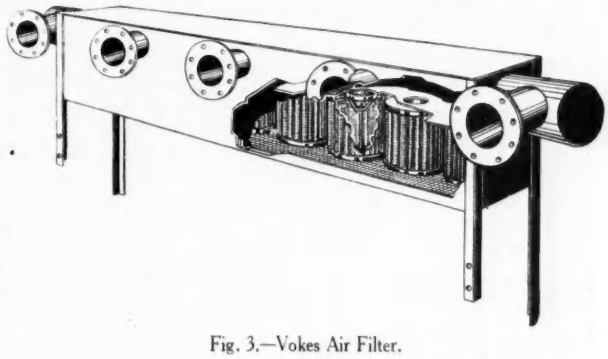


Fig. 3.—Vokes Air Filter.

Fig. 2 shows a large pipe line dust reclaiming filter, arranged to replace twelve feet of 3 ft. diameter pipe line. Voke's panel screens are employed in this filter, six screens being utilised on each side, each screen being independently removable in the form of a drawer. Periodically the drawers may be slightly withdrawn and pushed back sharply to shake off any accumulated dust. In this installation, four hoppers are provided at the base of the filter for collecting accumulated dust. The installation illustrated contains asbestos cloth as a filtering medium and is intended for use with hot gases. The plant in question when used for reclaiming white lead dust, is arranged to collect 5 cwt. of white lead in each of the four hoppers before it is necessary to stop the plant for the removal of this material.

An air filter which is standard equipment with one of the leading Diesel engine manufacturers is shown in Fig. 3.

This filter is arranged with five manifold connections for coupling to the intakes of a five cylinder engine. The filter contains eight cylindrical filtering elements arranged in star formation to obtain a large filtering surface in a compact space.

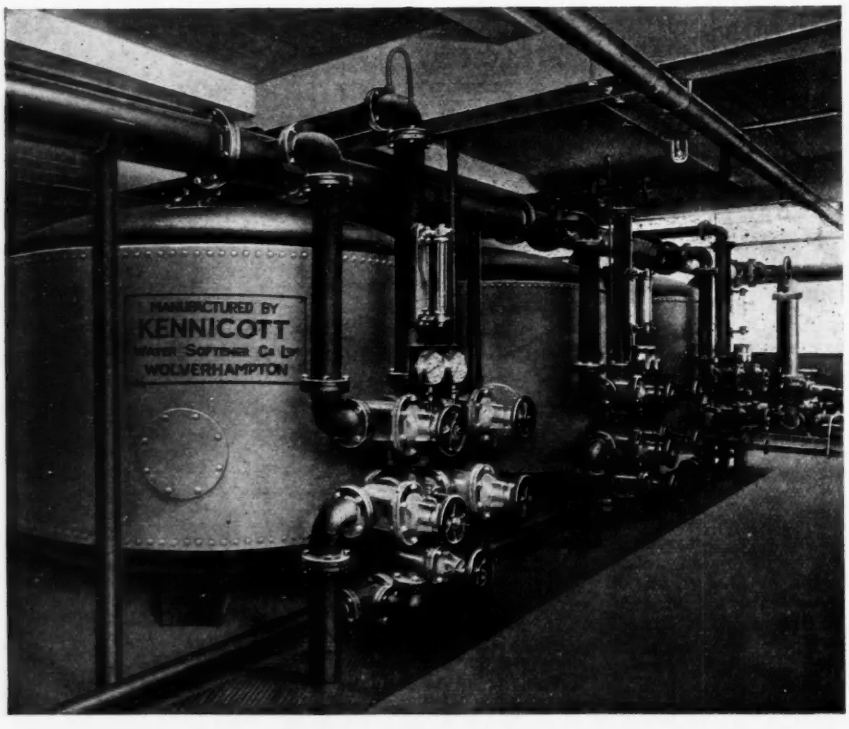
These filters are particularly valuable for use on Diesel engines, gas engines, air compressors and similar machinery and are invaluable for protecting the cylinder walls and pistons from the ingress of dust which without a filter is inevitable. All dust contains abrasive matter which is sufficient seriously to impair the efficient operation of any air-using machinery. The Vokes range of air filters therefore place at the disposal of the engineer a wide selection of carefully designed filters, capable of sustained operation at high efficiency and with unusually low maintenance costs. These filters are being widely applied to many kinds of air using machinery which is operated under so-called normal dust conditions.

This ensurance against wind-blown abrasive dust and the accumulation of abrasive matter which will always occur in time has been found to fully justify the nominal cost involved by the additional length of life it gives to the machine. C. G. Vokes, Ltd., also have an equally wide range of filters suitable for dealing with liquids in which the filtering media employed is based on similar extensive experience as in the case of their air and gas filters. One interesting example in this category is of the all-metal type especially designed for gases and liquids where an exceptionally high degree of filtration is required. These filters are employed for filtering gases before entering CO_2 recorders, where they will be found unequalled for extracting ash and moisture in very high percentages from the gas. They are also employed for filtering juices, etc., being capable of removing a considerable percentage of colouring matter from such products. The filter is equipped with a solid drawn steel case enclosing a large number of spirally wound square-sectioned steel tubes which are fixed to a foundation plate. The filtration takes place through the sides of the spirally wound wire tubes, which, owing to their square section, permits of a knife edge filtration and the fact that the spirals make metallic contact on each other renders the interstices so close that the finest filtration is obtainable.

Kennicott Pressure Sand Filter

The Cleaning Arrangements

THE Kennicott pressure sand filter is constructed for dealing with the filtration of water for town supply, and industrial purposes, in cases where it is desired to filter water under pressure, so as to avoid double pumping. The standard filters are made in all sizes from 3 ft. to 9 ft. diameter. The general construction of the filter consists essentially of a steel shell fitted at the bottom with a manifold system of pipes into which are screwed specially designed nozzles so as to ensure absolutely even distribution of the water through the whole of the area of the sand bed. The bottom of the filter is concreted in to the level of the filter nozzles so as to avoid dead water in the bottom of the filter. Above the nozzles are placed two or more rows of graduated gravel and above the gravel is placed a 2 ft. bed of specially graded quartz sand.



A Typical Installation of Kennicott Filters.

Kennicott filters are cleaned either by means of rake gear or compressed air. In the case of cleaning by compressed air, the necessary is introduced under the sand bed through a series of perforated pipes and the air is either introduced through these pipes by means of a steam air blower or alternatively the air is obtained from a compressor. Having blown air through the distributing pipes which causes each particle of sand to be thoroughly scrubbed against each adjoining particle for thoroughly loosening the dirt, the flow of water is reversed, passing upwards through the nozzles and washing the loosened dirt to drain through the collecting pipe inside the filter.

The normal cleaning of the filter carried out in this manner takes about 10 minutes. A sight glass is fitted on the drain outlet so that it is possible for the operator to see when the filter has been properly cleaned. Pressure gauges are also fitted to show the difference in head between the inlet and outlet and indicating when it is necessary to clean the filter.

Kennicott filters are also made of the gravity type, either of concrete or steel. The Kennicott Water Softener Co., Ltd., are also makers of water softening plants operating on the base exchange and lime and soda processes.

Wood Saccharification on a Commercial Basis

THE Deutsche Bergin A.-G., which for the last three years has worked on the experimental saccharification of wood, is reported to have purchased a factory at Manheim-Rheinau where the Bergius process will be placed on a commercial basis.

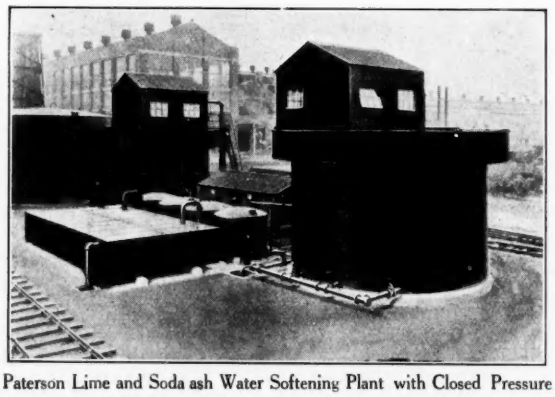
Some Notable Filtration and Water Softening Plants

The Ford Works Installation at Dagenham

ONE of the latest developments in connection with the activities of the Paterson Engineering Co., Ltd., is the use of closed pressure sand filters in conjunction with lime and soda ash water softening plant, particularly interesting for the chemical and many other industries, since softened water is obtained equal in clearness to that of town's supply, while self-contained wood wool filters are eliminated. Also, if necessary, as in the case of peaty discolouration, alumina coagulation treatment is included.

More and more there is a tendency to treat the whole of the water supply of a large industrial establishment, and in this connection the rapid gravity sand filter on standard town's supply lines is valuable, a typical " Paterson " plant in this field being at the Fushun Colliery in Southern Manchuria.

With regard to lime and soda ash softening in conjunction with closed pressure sand filters, the greatest interest attaches to one of the latest " Paterson " plants, which has only just been completed, at the Ford Works, Dagenham. This is one of the most remarkable establishments in the world, the capital cost involved being over £5,000,000, designed for an output of 200,000 cars per annum. Included is one of the



Paterson Lime and Soda ash Water Softening Plant with Closed Pressure Sand Filters at the new Ford Works at Dagenham.

most interesting steam boiler and power plants ever erected, in which there are three boilers operating at 1,200 lb. per sq. in., and the " Paterson " plant will supply softened water for both high and low pressure boilers, as well as the coke oven and by-product plant.

The Dagenham Plant

The arrangement consists of two vertical cylindrical reaction tanks, each with a capacity of 15,000 gal. of softened water per hour and with its own by-pass " Osilameter " measuring and chemical supply gear for the lime and soda ash reagents, as well as the soda aluminate; that is a total duty of 30,000 gal. of softened water per hour. Also each of these reaction tanks is 25 ft. in diameter and 18 ft. high, allowing three hours' settling, and the reagent preparation tanks are all on the ground level, with the solutions raised by plunger pumps to the top of the tanks.

The water is obtained from a bore hole and averages 26° total hardness, with a high magnesium content, while the softened water will be 3.5° total. Further, each of the reaction tanks connects with two standard " Paterson " 8 ft. diameter compressed air-cleaned pressure sand filters, that is a total of four, and the clear softened water passes into a closed receiving tank of compressed steel plates measuring 12 ft. long by 16 ft. wide by 4 ft. deep, having a capacity of over 10,000 gal., the whole constituting a fine example of the latest practice in water softening.

Interest attaches also to 16 large " Paterson " lime and soda water softening plants, with an aggregate capacity of over 6,000,000 gal. per 24 hours, now being erected for the London Midland and Scottish Railway. These embody not only closed pressure sand filters and six hours' settling, because of the unusually bad conditions with regard to magnesium content, but also have special arrangements for dealing with the lime sludge, including filter presses. As a result the product is obtained in the form of hard cakes, easy of disposal, entirely different from a large bulk of wet sludge.

Typical of one of these installations now completed is that at Bletchley, with a vertical reaction tank 30 ft. high and 23 ft. diameter, having a capacity of 12,000 gal. of pure softened water per hour. In this case two standard " Paterson " closed pressure sand filters of the vertical type are used, 8 ft. diameter, with a filtering surface of 100.0 sq. ft., operating on full load at 120 gal. per sq. ft. per hour.

Town's Water Supply

With regard to closed pressure sand filters, a notable installation is the largest town's water supply plant of this character in the world, at Thrum Hall Lane, Halifax, consisting of 84 standard " Paterson " pressure filters 9 ft. diameter, having a total filtering area of 5,340 sq. ft., with a maximum capacity of 12,000,000 gal. of water per 24 hours. There is also included a complete equipment for continuous coagulation treatment by means of alum and lime, due to the peaty discolouration of the water, and the 84 filters are arranged in four parallel rows of 21 filters each, with central operating gangways, in one main filter house 220 ft. long and 74 ft. wide. On the usual lines each filter is a steel plate cylindrical shell 9 ft. in diameter, of comparatively short height, with dished top and bottom, independently connected to the raw water inlet and the pure water outlet main, both of which are fitted with the necessary control valves.

The filtering medium is graded Leighton Buzzard sand supported on pebbles, and the cleaning is carried out by means of compressed air from two rotary motor-driven centrifugal air compressors, one being a reserve. In cleaning, the sand is agitated with the compressed air for two minutes to release the entangled impurities, which are then swept away to the drain by a momentary reversal of the flow of filtered water manipulating suitable valves for the purpose, after which the filter is put back on the line, the same sand lasting for years.

Alum and Lime Coagulants

The alum and lime coagulants are dissolved and stored in calibrated tanks with agitators, and the required amount of standard solution is added continuously to the raw water as it travels over the filters by means of electrically-driven plunger pumps. All the incoming raw water passes through a 36 in. Venturi meter device, which both gives a record of the volume of water and actuates a mercurial differential gear which alters automatically the speed of the electric motors driving the reagent pumps. In this manner any desired proportion of alum and lime is always added to the raw water irrespective of the fluctuations in demand, while every filter is also equipped with a patent Venturi meter device recording both the flow of the water during filtering and also that of the wash water. For very muddy water an open type of sand filtration plant is supplied, otherwise on the same general lines.

In the field of large rapid gravity sand filters constructed of a series of concrete tanks with compressed air cleaning, as already indicated, the Paterson Engineering Co., Ltd., has recently issued a book entitled " Modern Water Treatment," which deals at great length with this subject, and particularly the problems of filtration involved. The ordinary sand slow filter, in which the sand remains for a long period and is then dug out and cleaned, is now more or less obsolete practice, especially when new installations are concerned. Instead there is used the rapid gravity principle with compressed air cleaning at short intervals, and Paterson plants of this character are operating all over the world, including, for example, one of the largest installations ever erected, at Kempton Park for the Metropolitan Water Board, with a capacity of 48,000,000 gal. per 24 hours. In many cases also good results

are obtained by using existing slow sand filters in conjunction with a new installation of rapid gravity filters, the latter being used to treat the water and remove the bulk of the impurities first, with the existing slow filters to finish off the process.

Rapid Gravity Plants

Some notable "Paterson" rapid gravity filtration plants, in addition to the Metropolitan Water Board installations, are at the South Staffordshire waterworks, Sheffield Corporation, Newport (Mon.), Taf Fechan (Glamorgan), Southend, Rotterdam, Tallinn (Estonia), Rand Water Board (South Africa), Durban (Natal), Hong Kong (Bowen Road, Elliott, and Shing Mun plants), Singapore, Canton, Baghdad, Cairo, Khartoum, Omdurman (and other plants in Egypt and the Sudan), and a large number of installations in India, amongst the largest being New Delhi (15,000,000 gal. per day), and Hyderabad (10,000,000 gal. per day). Many of these filtration plants are also operating in conjunction with the "Chloronome" apparatus for the sterilisation of water by means of a measured trace of chlorine gas, which finds extensive application in other fields, including the treatment of condensing water for turbines to prevent organic growths on the condenser tubes, sewage and sewage effluents, and swimming baths, over 2,000,000,000 gal. of water per 24 hours now being sterilised on these lines.

Filtration plays a vital part in these sections of water engineering, and the use of closed sand pressure filters and filter presses for lime and soda ash softening plants is an example of the fact that power station practice is becoming more and more a question of chemical engineering. Similarly the closed pressure sand filter is an essential feature of modern methods for the continuous purification of swimming bath water involving sterilisation, while another application is filtration of water containing mud and sediment for treatment by the base exchange method of softening, in which connection the firm uses its own material "Basex." This gives zero hardness on the usual lines, and is interesting also for dual softening, *i.e.*, the operation of lime and soda ash and base exchange softening plants in series, using the latter to finish off the process, without the disadvantage of any appreciable amount of alkali in the final softened water.

Filtration Problems in the Chemical and Allied Industries

A Wide Range of Filters with Many Uses

This article describes the diversified activities of a company which has played a prominent part in the origination and development of vacuum and pressure filtration. The Dorr-Oliver Co., Ltd., has devoted over thirty years of exhaustive study to filtration problems, and there is scarcely a filterable product on the market which cannot be successfully handled by its machines.

THE past thirty years constitute a period of remarkable improvement in all classes of industrial equipment and processes, but probably none has undergone greater development than mechanical filtration in the separation of solids and liquids. Since 1902 there has been a steady advance in the art of filtration until to-day its use for dewatering and washing has become virtually standard practice throughout the entire chemical and allied fields.

It would be difficult to mention the particular applications of Dorr-Oliver filters in the chemical industry, as these filters are operating upon so many products in dewatering, washing and drying operations. Among the chemicals successfully handled by the wide range of filters produced by Dorr-Oliver Co. are lithopone (raw and finished); antimony sulphide; barium carbonate; calcium arsenate; calcium tungstate; dyes; gypsum, lead arsenate; sodium nitrate; sodium acetate; whiting; magnesium carbonate; ammonium nitrate; bicarbonate of soda; calcium phosphate; caustic soda; electrolytic zinc slimes; kaolin; pigments; saccharate of lime; and white lead.

One of the largest fields of application in the chemical industry is in the production of caustic soda, where lime sludge residues from the causticising process can be successfully dewatered and washed, giving a calcium carbonate practically free of soda content, and of a suitably low moisture content to enable the sludge to be handled in a relatively dry condition. In the production of lithopone both crude and finished products are successfully handled on Dorr-Oliver filters, and effluent clarification problems are often capable of solution by a combination of thickener and filter.

Beet Sugar and Cane Sugar

Oliver-Borden vacuum thickeners and Oliver drum type filters are widely used in the beet sugar industry for the filtration of first and second carbonisation juices. This method embodies two steps, first, the limed and carbonated juice coming from the heaters is subjected to a "roughing" or "thickening" process, the function of which is to filter out the greater part of the juice "proper" in the form of a bright sparkling filtrate. Secondly, the remaining sludge, containing the calcium carbonate and other insolubles, receives final filtration and washing with the Oliver drum type vacuum filter, to which process this sludge is especially amenable. The advantages which accrue from this treatment include minimum sucrose in washed lime cake; continuous operation; minimum wash water requirements; saving in filter cloth and labour, and cleaner filter stations. These advantages represent as a whole one of the most important improvements in the beet sugar manufacturing process of recent years.

In cane sugar refinery practice the Sweetland pressure filter has proved particularly successful in the filtration of washed sugar liquor, raw molasses and granulated syrup, and, as compared with plate and frame presses, results in greatly reduced labour costs on account of continuity of operation, and decreased cloth consumption. Another type of Oliver filter—the Oliver-Cachaza—is also extensively used in the cane sugar industry for recovering juices drawn off with the solid impurities which have settled out at the bottom of the juice clarifying tanks. This filter stands out as one of the most important modern developments in cane sugar factory equipment. By its use the process of making sugar is simplified and costs materially reduced. Its action is continuous and automatic—as the drum slowly revolves it automatically picks up a coating of solid impurities on its external surface, extracts the sucrose therefrom and after removing the surplus moisture discharges it in cake form suitable for use as a fertiliser.

The Salt Industry

The development of the rotary drum type vacuum filter for the filtration of crystalline materials, and the application of this machine to the dewatering of both vacuum pan and grainer salt, has met with marked success. The standard type of rotary vacuum filter was not successful in keeping the ordinary crystalline material in proper suspension in the filter tank, and the coarse solids settled out despite agitation. In the latest design of Oliver salt filter this difficulty has been overcome, and the incorporation of a heating unit and certain other modifications to the filter itself have made it possible to obtain a remarkably low moisture content in many filtration problems involving crystalline materials. For example, the old method of dewatering vacuum pan salt by stacking in a heap for draining resulted, after about three weeks' draining, in a salt with a moisture content of 3 to 3.5 per cent. The Oliver salt filter produces a salt with a considerably lower moisture content than the above, and enables the salt to be taken direct from the vacuum pan elevators and delivered with a moisture content suitable for feeding to the final drier.

Owing to the special type of wash apparatus incorporated with this filter, the salt delivered from the Oliver has a far greater purity than stacked salt. This increased purity, together with greatly reduced labour costs, are two of the main advantages of this salt filter, and combine to make it a very definite improvement to the process of salt manufacture. This

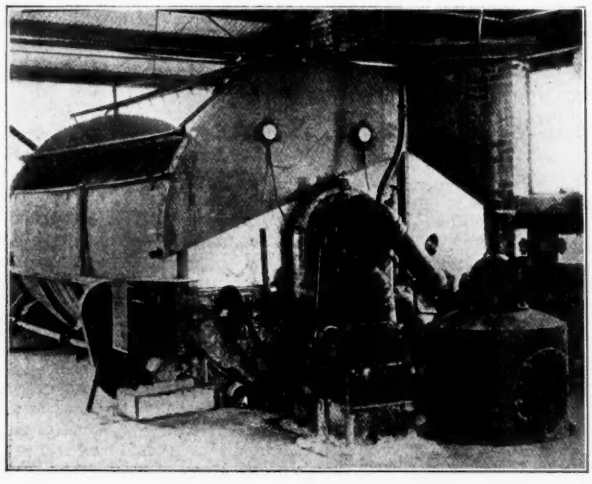


Fig. 1

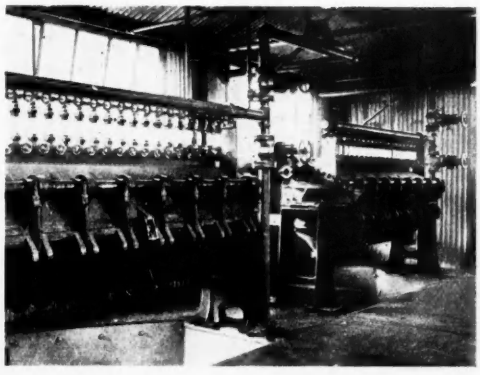


Fig. 2

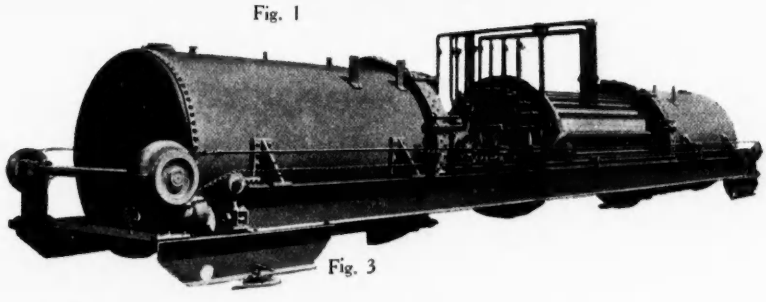


Fig. 3

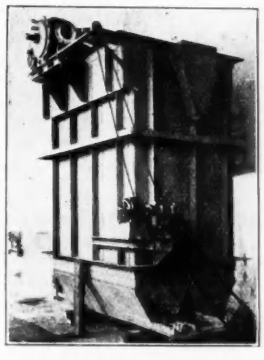


Fig. 4

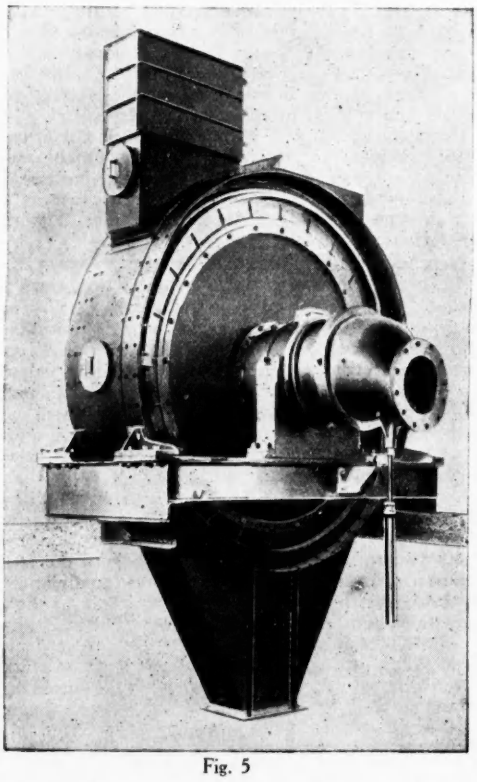


Fig. 5

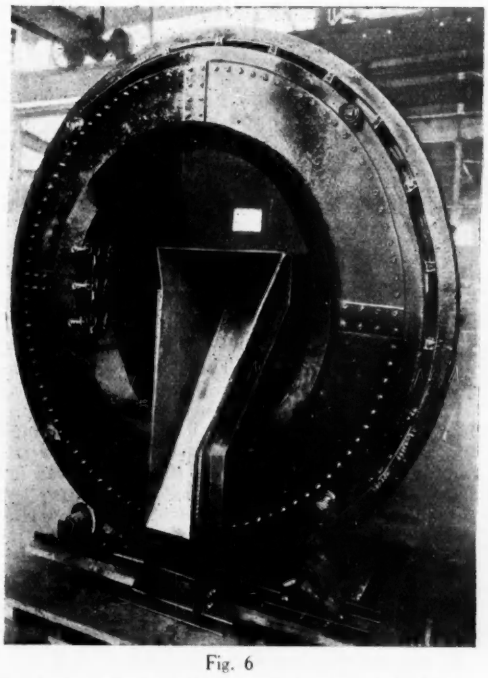


Fig. 6

Dorr-Oliver Filtration Plant.—Fig. 1. Oliver Rotary Vacuum Filter dewatering lime sludge. Fig. 2. Sweetland Pressure Filter. Fig. 3. Twin Kelly Pressure Filter. Fig. 4. Twenty-four tube Oliver-Bordon Vacuum Thickener. Fig. 5. Oliver Top Feed Filter. Fig. 6. Dorrco Filter, discharge end.

machine has also been successfully applied to the handling of all kinds of industrial products comprising coarse particles with a low proportion of slimes, such as certain metallurgical concentrates, building and phosphate sands, etc.

Problems in Oil Filtration

The Sweetland and Kelly pressure filters are widely used in refineries for various purposes. In the decolourising of oils by the contact process, after the oil and clay have been contacted for a sufficient period to obtain the maximum decolourising efficiency, the charge is passed to Sweetland filters for separation of the oil from the clay. This type of filter is specially constructed to extract the maximum amount of oil from the spent clay, this extraction being obtained in the filter either by means of subjecting the clay to air pressure or by means of a naphtha wash.

Sweetland filters are also used for filtering lubricating oils before shipment, as well as gasoline and petrol. Filtration problems in this field often call for a filter which can be operated at higher pressures and temperatures than are permissible with the Sweetland filter. To meet this requirement the Kelly pressure filter can be constructed for pressures as high as 250 lb. per sq. in. Kelly pressure filters have been installed in many refineries for the filtration of residium from cracking still operation. This process transforms the residium into a product which will pass the benzol B.S. test for fuel oil, and the rejected cake also becomes a marketable product. Generally speaking the Kelly and Sweetland pressure filters have the best application to oil filtration, although the Oliver rotary vacuum filter may, under certain conditions, be used to advantage.

In the manufacture of cement by the wet process, during the past few years fuel economy has been effected by several different methods.

Cement Slurry Filtration

Among these methods are the utilisation of the heat in the kiln exit gases for the generation of steam in waste heat boilers; the installation of longer kilns (250 ft. to 343 ft.) in a number of new plants; the introduction of slurry filters for removal of a portion of the water in the slurry as fed to the kiln, with a consequent reduction in fuel consumption. The latter process has now been applied to wet kilns of any length, many of which are connected to waste heat boilers, and by it the slurry is reduced to a moistened cake containing, in most cases, less than one-half of the original percentage of the moisture in the kiln feed. The rapid drying of the filter cake on entering the kiln speeds up the material for the calcining and subsequent clinkering zones.

Less water to evaporate reduces fuel consumption, and the acceleration of the drying process increases burning efficiency over the entire length of kiln and results in increased clinker output. Other direct benefits which accrue from slurry filtration are a more uniformly burned clinker; the elimination of mud rings; improved raw grinding, and the utilisation of flue and precipitator dust. Since the first cement plant incorporating slurry filtration was started late in 1925, fifty-seven kilns have been equipped totalling the imposing number of eighty-four Oliver disc type vacuum filter units.

Bell Pressure and Gravity Filters

Air and Mechanical Agitation

THE question of filtration as applied to the chemical industry falls into two main classes. First there is the question of purification, or treatment of water supplies for use in the various branches of chemical industry. Secondly, there is the question of dealing with liquids containing a certain amount of suspended matter which must be removed. In the first case the question resolves itself into dealing with various types of raw waters, and producing a filtered water applicable to the particular class of work for which the water is required. If the water is an acid water and discoloured it would usually be found that treatment with an alkali, such as chalk and sulphate of alumina followed by filtration through a sand filter, will give a water quite good enough for most manufacturing processes. If the water is still slightly acid a trace of lime may be added after filtration to neutralise this acidity, and bring up the *pH* value. Any or either of these different chemicals may be used in conjunction with sand filters, but in most cases it will be found necessary to use sulphate of alumina in order to form on the filter bed the necessary hydrate of alumina, which while allowing the water to pass through will retain the very finely divided suspended matter.

The Most Essential Feature

The type of filter used will depend on local circumstances, and may be either of the pressure type or of the gravity type. In all types, however, the most essential feature is that when the filter bed requires washing the washing arrangements provided with the filter are such that the bed is restored to its original clean state. The most efficient method of doing this is undoubtedly to use mechanical methods for agitating the filter bed whilst a reverse flow of filtered water is passing through. This agitation thoroughly scours all particles of dirt from the sand, and this dirt is carried away by the reverse flow of water. The filter introduced by Bell Brothers (Manchester, 1927), Ltd., has been perfected after 30 years" experience, and the fact that many installations have been working continuously for upwards of 15 and 20 years without once removing the sand is a sufficient testimony to its efficiency.

Another important feature in all filters is that the strainer arrangement should be so designed as to thoroughly distribute the wash water when washing, and collect the filtered water when filtering from all parts of the filter bed. In " Bell " filters the strainers and collecting pipes have been specially designed to give the best possible results, and their design is such that one grade of sand only is used, and as this is a very fine grade it means that the whole of the filter bed is available for efficient filtration whereas in other types of filters where a graded bed is used only a small portion of this bed is fine enough to act as an efficient filter. This strainer arrangement coupled with the mechanical agitation undoubtedly provides the most efficient filters on the market at the present time, and large numbers of municipalities, both at home and abroad, and even more industrial concerns have installed this type of filter, and obtained efficient working over long periods.

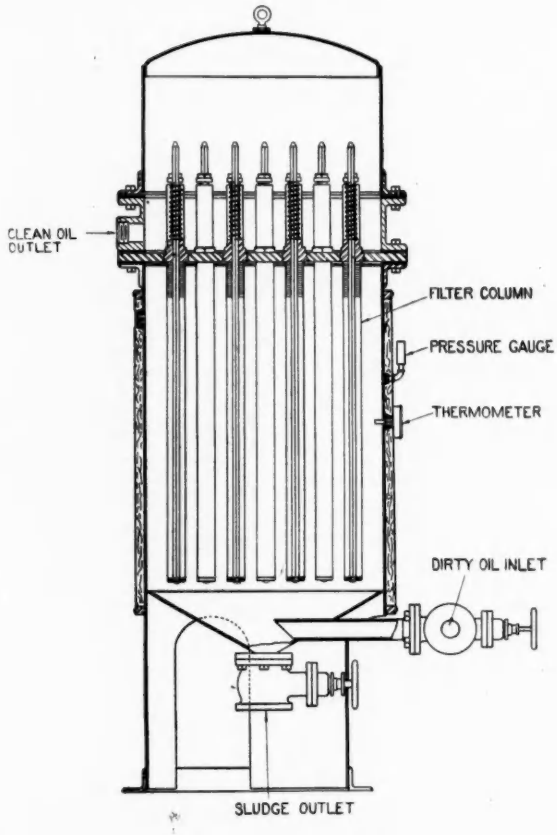
The foregoing remarks also apply to gravity type filters, although in this instance it is more usual for the filters to be constructed of concrete, and to be square or rectangular in shape, and air agitation is used instead of mechanical agitation. The method adopted when washing with this type of filter is to force a current of air through the filter bed which breaks up the bed and disturbs the dirt and afterwards passing a reverse flow of water upwards through the bed which carries away the dirt previously loosened. The disadvantage of this method of washing is that air and water will both take the line of least resistance, and the tendency is to form channels in the filter bed through which the air and water will pass leaving portions of the bed undisturbed and unwashed.

The " Bell " air scour filter, however, is so designed to obviate this possibility as much as possible, and the strainer arrangement already referred to is such that the air and wash water is evenly distributed throughout the whole of the filter bed. A further advantage on the " Bell " filter is that as only one grade of sand is used it is possible for very violent agitation to take place without any detriment to the efficiency of the filter whereas with a graded bed the agitation has to be restrained so as not to mix the coarse and fine media, and this means, of course, a lack of efficiency in washing.

Bell Brothers have installed many filters for dealing with different types of chemical liquids such as caustic liquor, formaldehyde, acids, petrol, syrups, etc., and are able to design filters to meet any reasonable conditions in connection with liquids.

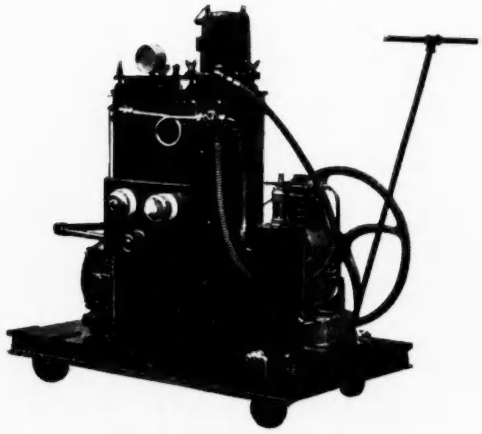
The Stream-Line Filter

THE principle of edge-filtration between paper discs which is the basis of the Stream-Line filter construction is well-recognised in industrial circles. By means of this arrangement filtration very much finer than could be obtained by the use of the paper as an ordinary surface-penetration filtering medium is obtained. Indeed the removal of solid particles



Section of a Large Filter.

down to a diameter of 1/100,000 cm. is possible. Stream-Line filters are in use in connection with the purification of beer, water, edible oils, chemical products, etc., but it is in its application to the reconditioning of used lubricating and insulating oils that the principle is best known.



The T3 Filter: Capacity 5-8 gal. per hour.

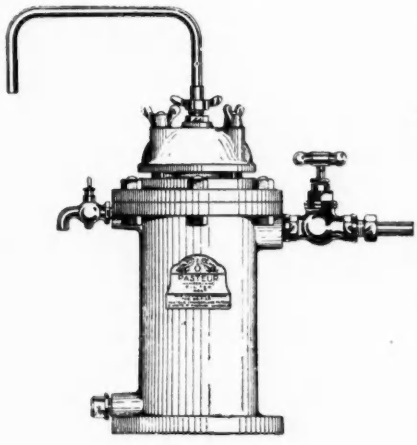
A usual form of construction for Stream-Line oil filters is illustrated. In this type each filter column is compressed by means of its own spring, and each column is separately removable from the filter in the event of any attention being necessary to the paper. In the ordinary way, however, the filter never needs to be opened up. The sludge accumulated on the filter packs is removed at the end of each day's run by reversal with compressed air. When dealing with insulating or lubricating oils the oil is heated in order to reduce the viscosity and so increase the rate of flow. In the case of large filters heating is done in a separate preheater, but in smaller sizes the heaters are incorporated in the filter, electric heating through a water-jacket being a common form.

In this connection it is of interest to note that equipment has been supplied to the Central Electricity Board for sub-stations on the grid schemes in Scotland, South-West England and South Wales. A total of 24 plants have been completed and 15 other plants are now being made, all for dealing with switch and transformer oils. In the case of 16 stations already in operation it has been found that in all cases the dielectric strength of the filtered oil has exceeded 60 kV compared with an average of under 20 kV for the used oil and 45 kV specified for new oil.

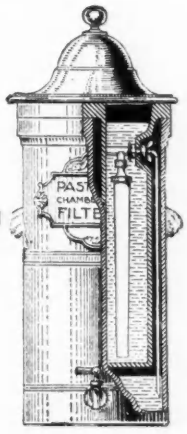
The second illustration shows a tiny portable equipment rated at 5 g.p.h. and suitable for taking round to small outlying transformers. In all cases when treating insulating oil the filter itself is supplemented by a special vacuum dehydrating process, so that the oil is delivered absolutely dry as well as free from even the smallest traces of solid impurity.

The "Pasteur-Chamberland" Filter

IT was over forty years ago that the problem of water filtration was solved in Pasteur's laboratory, when Dr. Chamberland, as the outcome of a long series of experiments, discovered that certain mixtures of earth, prepared in a particular way, and fired at a high temperature, gave a substance resembling biscuit porcelain in appearance, which unfailingly held back



Main Pressure Pasteur-Chamberland Filter.

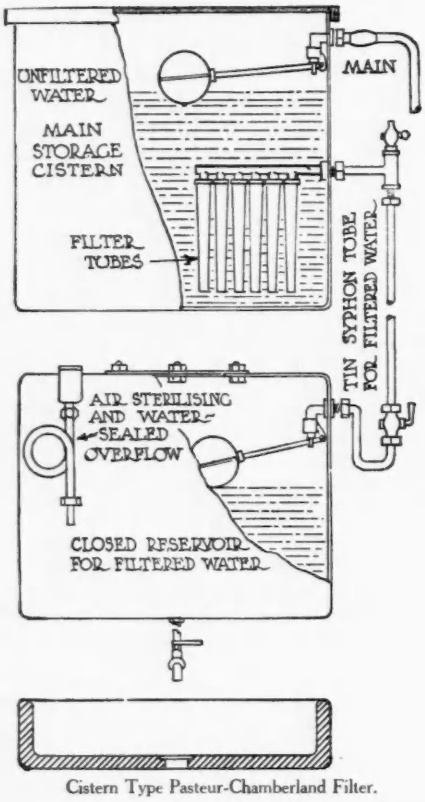


Non-Pressure Pasteur-Chamberland Filter.

all bacteria which were contained in liquids. The filter-tubes which resulted from this discovery were authorised by Pasteur to bear his name, and are now used exclusively in the Pasteur-Chamberland filter, made by The British Pasteur-Chamberland Filter Co. It is sometimes suggested that these filter-tubes are merely the embodiment of the "Pasteur principle of filtration" upon which principle other filters could equally well be made. Such a suggestion, however, is absolutely without foundation, and was repudiated by Pasteur himself.

Pasteur-Chamberland filter-tubes are hard and difficult to break, and the process of cleaning by brushing does not wear them away. Consequently they remain consistently efficient,

whereas it has been found that when softer materials have been tried, each brushing has exposed a fresh surface, of which the soundness can in no way have been assured by any test which may have been applied to the original tube. Filters fitted with this type of filter-tube are made in various forms for dealing with drinking water. For working under pressure there are filters ranging in size from those fitted with from a single filter-tube (yielding 20-gallons per day) to the



Cistern Type Pasteur-Chamberland Filter.

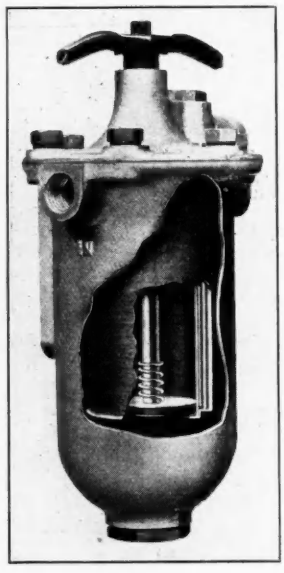
large "Marine" type filter (yielding 7,500 gallons per day). The latter type are installed on many of the White Star and Royal Mail vessels. The Pasteur-Chamberland filter is also adapted for the use of manufacturing chemists, mineral water manufacturers, and other industrial concerns, all such filters being fitted with genuine Pasteur-Chamberland filter-tubes. A range of filter-tubes is also made for laboratory use, in nine graduated porosities, and four different sizes.

Purolator Metal Element Filters

THE increased demand for an efficient form of metallic filter to replace the usual fabric, gauze or perforated metal type, has resulted in the production of the Purolator metal element filter, which has been designed on strictly scientific lines and constructed to withstand pressures without damage or loss of efficiency.

The high degree of filtration demanded by modern processes calls for a very fine mesh where wire gauze is used on the filter element, and the limitation of such filtering material is the fragility of the wire itself, which renders the element liable to fracture when used even under the lowest pressures. Where perforated metal is used as the filtering element, the degree of filtration is limited by the many difficulties met with in producing perforations of less diameter than 0.02 inch, which is too coarse for many filtration applications. The Purolator filter, supplied by Automotive Products Co., is constructed on an entirely new principle. On a former of determined dimensions is wound, edgewise, the special metallic ribbon (brass, copper, or stainless steel), which tapers in cross section and is provided at certain intervals with projections of uniform height. The height of these projections determines the degree of filtration which takes place and can be made as small as 0.0005 inch, thus preventing the passage of particles as minute as half of one thousandth of an inch.

Such a filter not only admits of fine filtration, but its construction forms an "edge filter" of a peculiar and improved design, and has the ability to shear particles of solid material from the filtrate, even when the size of the particle is smaller than the width of the opening between the edges of the ribbon. The front edge of the filter presented to the dirty oil or other fluids to be cleaned is not flat, but curved outwardly so that back flow for cleaning drives the entire cake off the surface of the filter instead of leaving portions still attached. The effect of the tapered cross section of the ribbon renders it impossible for wedging to take place behind the edge; wedging clogs the filter and makes cleaning by back pressure or agitation difficult. These metal element Purolators, moreover, can be provided with a self contained cleaning device. This is constructed in the form of an integral plunger, operated by the outside handle, which forces a portion of the already filtered liquid through the filter in a reverse direction to the normal flow, thus removing the whole of the foreign matter adhering to the outside of the element and depositing it in the sump of the filter body, where it can be drained off at convenient intervals. They are made in a comprehensive range for chemical works, sugar refineries, breweries, preserving factories and dye works, as well as for the filtration of Diesel fuel oil, lubricating oil and fuel oil.



The Purolator Metal Element Filter.

A Non-Corroding Filter Bottom

As a result of recent research into the problems of corrosion, a concrete duplex filter bottom has been developed. It is constructed of concrete material throughout with porcelain nozzles, there being no materials in contact with the water that are subject to corrosion. The underdrain arrangement consists of a primary system comprising a concrete header flume and concrete laterals, in the top of which are cast glazed porcelain nozzles. The laterals are cast 12 in. apart and the nozzles are set 8 in. apart. On the top of this primary system are placed precast concrete blocks, 12 in. wide and 24 in. long. The blocks have corrugated tops and are perforated with small holes in the tops of the corrugations. Only 6 in. of filter gravel, it is claimed, is necessary, with a maximum size of $\frac{3}{4}$ in.

Refining of Kauri Gum

New Zealand Plant in Operation

A NEW plant to refine kauri gum chips and the lower grades of gum, recently erected at Henderson, Auckland, is about to start production. The plant will use a method evolved as a result of research by the New Zealand Department of Scientific and Industrial Research. Previous attempts to refine gum were unsuccessful, but it is believed that the difficulties have now been conquered. When the new plant has handled 50 tons of gum the proprietors intend to remove it to the gum fields at Tomarata, where new methods of digging are being put into operation to produce the raw material at a low cost. It is hoped to place on the market a uniform product which will command a ready sale and challenge artificial resins.

The Coke Oven Managers' Association

Problems of Efficient Fuel Utilisation

THE annual dinner of the Coke Oven Managers' Association was held in the Wharncliffe Rooms, Hotel Great Central, London, on Thursday, October 20. Mr. G. T. Purves, who had been elected president at the annual meeting in the afternoon, was in the chair and the principal guest was Dr. W. Benton Jones, vice-president of the Mining Association of Great Britain, and chairman of the South Yorkshire Coal Trade Association. An invitation to the dinner had been accepted by Mr. C. M. Schwab, president of the Bethlehem Steel Corporation, U.S.A., but he was prevented from attending through indisposition.

Mr. E. M. MYERS, chairman of the Northern Section of the Coke Oven Managers' Association, proposed the toast of the "Allied Industries." He appealed to the iron and steel masters of this country to have the courage, the vision and even the audacity to put the coke oven industry in its right place so that it could compete with the coke oven industries of every other country. He claimed that the Coke Oven Managers' Association in its membership had the ability, the initiative and the courage to give the iron and steel masters all the necessary information, and the coke oven managers were merely waiting for the word "Go." An important allied industry was the coke oven construction industry, because a large percentage of the advances that had been made in the coking industry had been due to their efforts and their efforts alone. The refractory industry, through the efforts of the Ceramic Society, was assisting the coke oven managers to maintain their position, technically, in that branch of the industry. Next, there was the chemical industry, both generally and especially that portion of it which depended for its raw materials, such as tar and benzol, upon the coke oven industry. Mention must also be made of the engineering industry and the technical Press for the part they played in assisting coke oven managers to maintain their position. Last, but by no means least, there was the gas industry.

Co-operation in the Carbonising Industries

Mr. R. E. GIBSON, president of the Institution of Gas Engineers, in response to the toast, said the gas industry desired to co-operate with the coke oven industry as far as possible and it would certainly far rather co-operate than be in competition. A great deal had been heard recently about the "back to coal" movement but he hoped that that expression would not be misunderstood. Personally he did not quite know what it meant himself. If it meant the replacement of oil, that was all to the good, but if it meant going back to raw coal, that would be a very retrograde step as regards domestic use at any rate. If, however, "back to coal" meant the most efficient methods of using coal, then there was everything to be said for it.

Dr. W. BENTON-JONES, vice-president of the Mining Association of Great Britain, proposed "The Coke Oven Managers' Association." The Association, he said, was formed in 1915—not very long ago—but in that short space of time it had thoroughly established itself. It had a large membership and satisfied the requirements of that membership. Referring to low temperature carbonisation, he said that whereas in the high temperature process the coal owners were producing a fuel for which they had no other substitute, in the low temperature process, if they adopted it, they were merely displacing a fuel which they already supplied. The high temperature process was one which had been developed over a large number of years, and the coke oven managers and their collaborators, the designers of coke ovens and the builders, were to be congratulated on the state of perfection to which they had raised the high temperature carbonisation process. Other ideas had been promulgated from time to time as to how the coal mining industry could be saved. There was pulverised fuel, hydrogenation and colloidal fuel, but it always seemed to be overlooked that if any of these processes were to be developed they would require the investment of a large amount of capital and the development of a technique for which those concerned would require a return on a larger scale than the return now being obtained in the coal industry. At a dinner in the city recently somebody had made sarcastic remarks to the effect that the coal industry did not busy itself sufficiently in the matter of research but as a matter of fact the coal mining industry was concerning itself with research although perhaps not in a spectacular manner. It had not a huge central laboratory but it was supporting universities in different parts of the country in work relating to the nature of the coal in the particular district.

The Economic Coking Unit

The Coke Oven Managers' Association, in its wisdom, had arrived at what was called the economic coking unit which, he understood, meant that if a coking unit was made less than a certain size it was not theoretically economic. On the question of the location of coking plants, there were a large number of isolated plants not connected with steel works. At these plants there was a large quantity of surplus blast furnace gas which would supply the heat required by these units, but there was no place for a coke oven plant. On the other hand there were iron and steel works which were sufficiently large to make full use of a coking plant because they were able to use all the gas which an economic unit of coking plant could use. If, in order to make use of the gas made at these works where a coke oven plant could not be installed, a plant was installed at some central situation it would mean the collection of material from a large number of points and conveying the surplus gas to some large city willing to receive it. There would have to be housing accommodation and a large capital expenditure involved. In view of this he suggested that smaller coking units should be installed at collieries. Such units had been in use for many years and were serving a great convenience and for this reason he contended that coking plants should be dealt with from this point of view.

Mr. G. T. PURVES, president, responding to the toast, said the suggestion by Dr. Benton-Jones to use smaller coking plants was an important one but it had to be remembered that there were several factors which determined the size of plant. Perhaps the most important one was the cost of coal. Since the Coal Mines Act of 1930, the coking industry had had to buy dearer coal because there had been a shortage of small coal, and there was no indication that that position would alter. Thus, the coking industry was faced with the problem of making cheaper coke from dearer coal.

Mr. R. RAY proposed "Our Guests" and expressed regret that Mr. C. M. Schwab had been prevented from being present through indisposition.

Professor C. H. LANDER, Imperial College of Science and Technology, who responded to the toast, said that being no longer connected with the Fuel Research Board he could say in all sincerity that this was a perfectly unbiassed body, willing to help in every possible way in connection with fuel problems.

No Control over Oil

Mr. R. G. CLARRY, M.P., also responded. Referring to the economical consumption of fuel, he said it had to be visualised that if present conditions continued with the influx of oil into this country, the prosperity of this country would hang on an oil pipe line over which we should have no control whatever. Moreover, the price of oil could be put up in a day and nothing could be done with regard to it. Therefore, it was more essential than ever on the part of those who were dealing in a scientific way with the coal resources of this country to educate the consumer in the correct way to use coal in the most efficient manner.

Mr. T. G. WATTS proposed the toast of "The Universities."

Professor G. G. HENDERSON, president of the Chemical Society, responded to the toast. He said that the function of a University was two-fold. In the first place it was to impart knowledge and its second function, which he felt was more important, was to increase knowledge. It could be stated that without doubt activity in research of all kinds in our Universities to-day had reached a stage which it had never reached before.

Transport of Dangerous Chemicals in Ships

Amended Regulations issued by the Board of Trade

AMENDED regulations relating to the carriage of dangerous goods and explosives in ships have lately been issued by the Board of Trade in the form of a supplement to the Memorandum issued in 1931. Copies of this supplement can be obtained from H. M. Stationery Office at the price of one penny. The chief amendments included, so far as they relate to chemicals, are given below.

Glacial acetic acid and acetic acid of 80 per cent. to 90 per cent. strength may now be carried in sound watertight waxed-lined wooden barrels.

The air space to be allowed for thermal expansion of antimony chloride liquid need not exceed 5 per cent. instead of the 10 per cent. laid down on page 78 of the previous memorandum.

Ferro Silicon and Granulated Metal

Condition No. 4 on page 96 of the previous memorandum relating to ferro-silicon should be deleted. Ferro-silicon if carried under deck must now be stowed in a dry well-ventilated compartment not containing explosives, caustic alkalies, foodstuffs or other cargo liable to damage by poisonous gas. The compartment must not be immediately below living quarters and must be separated by a watertight bulkhead from any part of the ship occupied by passengers or crew.

As an alternative method of packing to that laid down in the previous memorandum, granulated aluminium, brass, bronze, copper, lead, tin and zinc may now be contained in small hermetically sealed tins packed with sawdust, wood-wool or other suitable insulating material in a strong outer case.

For bituminous paint, the entry on page 79 of the previous memorandum should be deleted. Bituminous paint with a flash point of 93° F. or over may now be packed in drums of a capacity not exceeding 10 gallons or in tins up to one gallon capacity packed in cases with suitable absorbent material, with a maximum of 16 gallons in each case. For carriage in temperate or tropical climates a free space of 5 per cent. or 7½ per cent. respectively must be left in each container for thermal expansion. It may be carried either on deck, or under deck in a cool well-ventilated and easily accessible place away from living quarters, but when carried under deck in emigrant ships special stowage must be arranged to the satisfaction of the Emigration Officer. In ships carrying explosives it may only be carried if the engine and boiler room spaces intervene between the holds in which the explosives are stowed and the spaces in or over which this substance is carried. When the flash point is below 93° F. bituminous paint should not be allowed in emigrant ships, but in other ships it may be carried if packed and stowed as above.

Hydrochloric and Hydrofluoric Acid

As an alternative method of packing to that laid down in the previous memorandum, hydrochloric acid may now be carried in securely closed glass or earthenware containers packed singly (1) in wicker hampers with wicker bonnets; (2) in stout slatted crates lined with stout corrugated paper and with adequate protection for the neck of the container; or (3) in strong iron hampers with suitable bonnets with not less than ½ in. of straw packing or other suitable insulating material between the container and the hamper, the whole being placed in a close-fitting case, crate or hamper. The packages may be carried on deck only, and the gross weight of any package must not exceed 2 cwt. An air space of 5 per cent. should be left in all containers for this substance.

Hydrofluoric acid of a strength of not less than 58-60 per cent., which is substantially free from mineral acids, such as sulphuric acid, may be carried in iron drums as an alternative to leaden and gutta percha bottles provided the drums have been rendered passive in a manner approved by the Board of Trade, and are accompanied by a certificate that they have been so treated. One method of rendering drums passive for which approval has been given requires each drum to be filled to 90 per cent. of its capacity with hydrofluoric acid of 58 per cent. strength and allowed to stand for 48 hours at a temperature of 80° F. and then for 7 hours at 140° F., the pressure being maintained at that of the atmosphere by means of a ventilated bung. The drum subsequently should not be washed with water. An air space of at least 10 per cent. should be left in each drum, the gross weight of which must not exceed 2 cwt.

Inflammable Liquids

Consideration will now be given to applications which may be made as occasions arise for the carriage on deck, in ships carrying only a few passengers, of limited quantities of inflammable liquids flashing below 73° F. and miscible with water, not exceeding a total of 900 gallons, in containers up to 90 gallons capacity. It would be necessary for stowage to be arranged on deck in a space away from all living quarters and not accessible to passengers, and for a hose and water supply to be immediately available. Smoking and the use of naked lights in the vicinity of such deck cargo would have to be prohibited and a notice to that effect prominently displayed near the place of stowage. The substances affected by this amendment of the previous memorandum include acetone, diacetone alcohol, ethyl alcohol, methyl alcohol, methylated spirit, propyl alcohol and pyridine. These liquids would not be allowed in emigrant ships except as provided for alcohol compounds in the Dangerous Goods Memorandum.

Phosphoric acid, of specific gravity of 1.2 or over, may be carried in 1 cwt. or earthenware containers. Each container, in which an air space of 5 per cent. should be allowed, should be protected by means of straw wrapping and tightly packed with straw in a strong wooden case.

Sulphur and Sulphur Acids

Except when in powder form sulphur may be carried in bulk in passenger ships provided that (1) the hold in which it is stowed is capable of being effectively sealed; (2) the hold is clear of passengers' and crew's accommodation and of artificial sources of heat, and (3) the ventilators of the hold are capable of being closed and are covered with fine wire gauze to prevent sparks reaching the sulphur.

For sulphuric acid and sulphurous acid the air spaces to be allowed for thermal expansion of these substances need not now exceed 5 per cent., instead of 10 per cent. as laid down on pages 130 and 131 of the previous memorandum.

Regarding potassium nitrate, referred to on page 123 of the previous memorandum, it is now stipulated that although potassium nitrate acts as a very powerful oxidising agent, in emigrant ships a limited quantity may be carried under deck packed in paper-lined casks if stowed to the satisfaction of the Emigration Officer.

Sodium azide may be carried in cargo ships in sealed air-tight tinned iron containers packed with insulating material, such as wood-wool in wooden cases and stowed either on deck by itself or under deck away from combustible materials, acids, food-stuffs and living quarters in a dry, well-ventilated compartment adjacent to a hatchway and not overstowed by other cargo, but the gross weight of any package should not exceed 1 cwt. This material in contact with moist air and acids will give off a poisonous gas and, when directly heated (to 350° C.), will decompose with the formation of metallic sodium. When heated through proximity to a fire such as might occur on board ship it may explode with considerable violence.

World Production of Copper Sulphate

ACCORDING to the Statistical Year-Book of the League of Nations the world production of copper sulphate for 1930 was estimated at 227,000 metric tons. Production estimates for individual countries were: Italy, 69,000 tons; United Kingdom, 43,000; France, 40,000; United States, 17,000; Belgium, 19,000; Germany, 15,000; Hungary, 9,000; Spain, 6,700; and Austria, 1,100 tons.

Physical Methods for the Examination of Paint

Difficulties Attending the Measurement of Durability

OBSERVATIONS on physical methods for the examination of paint was the subject of Mr. J. A. F. Wilkinson's presidential address to the Oil and Colour Chemists' Association at the opening meeting of the session, held in London on Thursday, October 20.

Speaking first with regard to specifications Mr. Wilkinson pointed out that the British Standard Specifications for linseed oil paints are at present necessarily restricted to those ready-mixed paints which can be prepared with a "straight linseed oil" vehicle. The specifications so far issued therefore, catered mainly for what might be called the "heavy" paint trade, and did not as yet include the very numerous paints and enamels made with various kinds of varnish vehicles. Such an extension had been considered, more than once, by a special committee of the British Standards Institution, but the difficulty had always been that suitable methods of test for this class of paints were not available. He did not wish to give an impression that even if reliable methods were available, physical requirements were the only ones which should be specified. So-called "chemical" requirements must also be included to some extent. It was true that simple physical methods of testing had from time to time been embodied in specifications and had even found their way into the British Standard Specifications for varnishes and some of those used by the Air Ministry for special materials. His own experience was, however, that from the point of view of their wider use these laboratory tests were open to criticism since, in the case of paints, their accuracy and reliability were questionable.

Vehicles for Paint Making

With recent developments of synthetic resins the diversity of vehicles available for paint making had enormously increased, and there was little doubt that, owing to their special properties, the importance of such products would be even greater in the future, as their use extended. The need for reliable and accurate physical methods of examination was, therefore, more urgent than it used to be.

A great number of methods for the assessment of physical properties of a paint had been published in the literature from time to time, yet not a single one of these methods, except to a limited extent in the case of colour and drying time, could be said to have met with general acceptance in the same sense, as standard tensile tests have been accepted in the metal and textile industries, or standard methods for measuring viscosity and other properties in the oil industry. The difficulties which stood in the way of such standardisation were certainly considerable, but a good deal of preliminary work had already been done, and it ought to be possible to reach some sort of agreement within a reasonable time, if the necessary investigations could be put in hand without delay. Co-operation was essential, and, whatever arguments there might be for secrecy in other matters concerning the industry, there were surely none which could legitimately be urged against the fullest publicity for investigation work on the measurement of the physical properties of paint and varnish.

Drying under Standard Conditions

Before any useful measurements could be made on a dried paint film it was necessary to apply some particular thickness of paint to a standard surface and to dry it under standard conditions. It was not always an easy matter to apply a particular amount of paint to a specified area of surface in a uniform manner. It might, however, be possible to obtain films of comparable thickness in the particular case of different paints, all of the same type, and from a specification point of view the case might not, therefore, be quite so hopeless as it might seem. It would probably be necessary to specify some simple plastometric test, in order to ensure brushing qualities. If in addition the pigment and thickness were specified, then spinning under constant conditions might possibly result in films of nearly the same thickness, even in the case of paints containing different vehicles. Drying under standard conditions also was a difficult matter but it should not be impossible to devise a simple form of apparatus, employing some form of artificial illumination which would simulate average natural drying. In the case of stoving paints, light had not been considered, and, if suitable precautions were taken, a film similar to that obtained in practice could be produced in the laboratory without difficulty.

For the measurement of hardness a good many methods had been proposed, the best known being those in which the film was scratched with some form of loaded point. The scratch test, however, was not very satisfactory for quantitative work on paints, although it might be of some use for varnishes. Of the remaining instruments for measuring hardness, the rocking pendulum appeared to be the most attractive proposition, although further work was required before it could be used with confidence.

Measurement of Flexibility

Although in the cases of varnishes the ordinary bending test was fairly satisfactory for flexibility, provided that the prescribed conditions were carefully observed, it was not suitable for paints as it stood at present. Fine cracking at the bend could not be seen with the naked eye, and it was necessary to apply some other method of determining when breakdown occurred. He had found that the best way of doing this was to use a simple electrical indicator. This consisted of a battery placed in series with a voltmeter, a metal plate covered with a pad of filter paper soaked in strong salt solution and the bent metal strip covered with the paint film. The bend was pressed on to the wet filter paper and, if the film had cracked, the circuit was completed and a reading was obtained on the voltmeter; this worked satisfactorily provided two coats of paint were applied.

Durability was the most difficult property to measure. To begin with, it was not at all easy to define, and we were not even agreed on a criterion for judging when the useful life of a paint film was at an end. When we had decided how to judge when a coat of paint had broken down, there was still the difficulty that its life was, to a large extent, dependent on the particular surface to which it was applied and the conditions of application and exposure.

Institute of Chemistry Examinations

September Pass List

IN the Institute of Chemistry September examination in General Chemistry for the Associateship; the following candidates were successful:—

L. H. G. Barton, the Polytechnic, Regent Street; T. E. Burke, Central Technical School, Liverpool; L. H. Bussell, Birkbeck College, London, and West Ham Municipal College; H. T. Currie, Municipal College of Technology, Belfast; C. Edwards, University College, Nottingham; D. N. Gore, Technical College, Cardiff; W. Johnston, Heriot-Watt College, Edinburgh; R. E. Jones, College of Technology, Manchester; G. E. Macdonald, Central Technical School, Liverpool; R. K. Matthews, Central Technical School, Liverpool; G. Moses, College of Technology, Manchester; Miss E. C. Reeve, Sir John Cass Institute; L. A. Stocken, University College, Nottingham; G. J. Trower, Royal College of Science, and Sir John Cass Institute; H. L. Turner, Central Technical College, Birmingham; W. B. Walker, College of Technology, Manchester; and E. G. Whittle, Portsmouth Municipal College.

The following were successful in the examinations for the Fellowship: Inorganic chemistry.—R. H. Jones. Inorganic chemistry, with special reference to metallurgy and metallography of steel, etc—R. Ward. Organic chemistry, with special reference to oils, fats, etc.—J. S. Thompson and T. P. Williams. Biochemistry, with special reference to proteins, vitamins and hormones—F. O. Howitt. The chemistry, including microscopy, of food and drugs, and of water—W. J. Abbott, L. Cocuzzi, P. D. Coppock, F. W. Edwards, W. F. Greeves, I. A. Simpson, and C. V. Reynolds. Agricultural chemistry—N. H. Pizer. Industrial chemistry, with special reference to oils, fats, etc—G. R. Gilson.

By-Ways in Calico Printing

Avoiding Deterioration of the Diazo Compound

ALTERNATIVE methods of calico printing which were not commonly met with in commercial establishments were reviewed by Mr. W. F. A. Ermen at a meeting of the Manchester Section of the Society of Dyers and Colourists, on October 21. He referred in particular to a method of printing azoic colours which appeared to have attracted little attention. All the troubles and trials involved in the prior preparation of the diazo compound, the gradual deterioration of the same during use, were avoided by the simple expedient of making the diazo compound at the moment when it was required. It then coupled at once to the full extent before it had had any time to undergo decomposition, after which it was ready for washing off and finishing just like a print made in the orthodox manner. The print colour contained, instead of the diazo body, the hydrochloride of the requisite amido body, if that was sufficiently soluble, together with an excess of some organic acid, which might be either acetic, formic, oxalic, lactic or tartaric acid. If the hydrochloride was too insoluble, the base itself was dissolved in whichever of the organic acids mentioned, or a mixture of the same, was found to be most suitable. The nitrous acid for the diazotisation was provided by the addition of the requisite quantity of sodium nitrite to the naphthol padding liquor, with which it in no way interfered. Cloth prepared in this way kept just as well as that which had been impregnated in the normal manner with an alkaline solution of a naphthol alone.

Development of the Colour

As soon as the design was applied to the cloth by the agency of the printing roller, the organic acids present attacked the sodium nitrate in the cloth, and liberated nitrous acid. This naturally carried out its appropriate rôle with the amido compound with which it found itself in contact. The diazo compound thus automatically produced, proceeded at once to fulfil its destiny by coupling with the naphthol which is found conveniently to hand. It took an appreciable amount of time to carry out this chain of reaction so that the full colour of the design came up considerably more slowly than it did in the normal process, but, in the end, the colour was just as good. Furthermore, there was no danger of the deterioration of the print paste, since this contained only the amino body dissolved in excess of acid. This method was described by Haller in his book on the printing of textiles, but he made no mention of the precautions which were necessary to prevent the process from turning out a failure. If the printed cloth, after the full development of the colour, was passed straight into water, serious bleeding took place. The unprinted portions of the cloth coloured up until they were stained almost as deeply as the pattern itself. The pattern contained some necessary excess of amino body together with a considerable excess of free acid. The white ground all round carried naphtholate, not very soluble in water, and very soluble sodium nitrate. The nitrate and the acid salt of the amido body diffused into the wash water, and naturally interacted to form a diazo compound, whilst the naphtol coupled up greedily, with disastrous results.

Inhibiting the Formation of Diazo Compounds

The formation of diazo compounds must be altogether inhibited when they were not wanted, or else they must be destroyed before they had time to do any damage. Diazo compounds were nearly all destroyed by a rise in temperature, so that it would appear that a first wash in boiling water would do all that was required. Immersion of the print reduced the damage, but it was by no means a satisfactory solution of the difficulty. Diazo compounds were reduced by bisulphites, and a preliminary wash in a weak solution of sodium bisulphite could be shown to give a perfectly clean paint. Sodium bisulphite was acid, however, in its reaction, and thus decomposed the sodium naphtholate which was on the unprinted ground. The naphthol thus liberated was insoluble in soap liquors, and so the ground could not be made to give a clean white unless the final clearing bath had an addition made to it of caustic soda. Some of the azoic colours were, however, not sufficiently fast to dilute boiling caustic soda, and thus the design tended to be gradually weakened. By giving the print a first wash in an alkaline liquor, all the free acid in the design would be neutralised, thus preventing the formation of any additional diazo compound. It would appear that a solution of sodium carbonate should be capable of effecting this neutralisation, but in actual practice the protection thus afforded would be found to be inadequate. There was still some bleeding, even if the carbonate solution was used at the boil. A cold dilute solution of caustic soda, however, was capable of totally inhibiting bleeding of the print, and at the same time extracted most of the naphtholate from the ground. There followed a rinse in cold water, and, finally, the boiling soap bath in which the colour was brought up to its full shade and fastness.

The lecturer made various comments upon the printing of vat colours and the use of Colloresin D.K., a derivative of cellulose, and stated that similar results could be obtained by the use of gum tragasol. He described also certain experiments he had made in regard to producing photographs in vat colours by means of suitable negatives.

Prevention of Steel Corrosion

German Research Work on the Value of Red Lead

AN interesting comparison of the relative properties for iron and steel of red lead and oxide iron paint for the protection of iron and steel appears in a recent contribution by H. Hebberling in "Farbe und Lack" March 23 and April 6, 1932. It is emphasised that red lead paint owes its valuable properties of protecting iron and steel to two main reasons. The first is that red lead is a chemically active substance and acts as an oxidising agent in the sense that it forms on the surface of the iron or steel a highly resistant thin film of iron oxide that is "passive," so that the electrolytic actions necessary to corrosion cannot take place. In addition, red lead forms very stable lead soaps with the linseed oil, which increases the beneficial property of the paint, both as regards resistance to corrosion and the rate of drying. Iron oxide, on the other hand, possesses no such inhibiting properties and the paint merely forms a film giving mechanical protection for a relatively short period, a physical property which is also possessed by read lead to an even better degree, because of the greater weight of this paint.

Further work on the action of red lead and lead compounds generally, in forming a "passive" condition on the surface of the iron and steel, has been carried out in Germany by M. Ragg and A. Riedermann. The latest results are given in a contribution appearing in "Farben Zeitung," May 7 and May 14, 1932. These investigators have determined the actual diminition of the potential of iron plates in a solution of an electrolyte when treated with lead compounds to give the "passive" condition. They are of the opinion that the action of red lead on iron is to form a strongly cohesive and protective or passive film of iron oxides which is of great value in preventing rust formation.

Research in the Mineral Industry

A New Circular of the Bureau of Mines

THE United States Bureau of Mines, in co-operation with the Committee on Correlation of Research of the American Institute of Mining and Metallurgical Engineers, has just completed the compilation of a list of research problems engaging the attention of those industries dealing with minerals or mineral products, which has been published as Information Circular 6637, by A. C. Fieldner and A. H. Emery. Copies of this circular, "Research Activities in the Mineral Industries of the United States: A List of Problems Reported to the Bureau of Mines in 1930 and 1931," are available for distribution to those particularly interested and may be obtained on request to the United States Bureau of Mines, Washington, D.C.

News from the Allied Industries

Mineral Oils

THE POLISH OIL INDUSTRY has formed a trust, with the approval of the Polish Government. The trust will fix home and foreign prices, decide export policy, the amounts to be exported by each company, etc. It is understood that the home prices will be increased, so as to lower export prices.

SOVIET NAPHTHA continues to dominate the Latvian market, and 4,000 tons of Caucasian naphtha have just arrived here. Pointing to Latvia's constantly satisfactory balance of trade with Britain, local importers of British naphtha products express the hope that the Latvian Government will give British products a fairer chance in the Latvian market when signing a new commercial treaty with the Moscow Government.

Beet Sugar

THE NATIONAL FARMERS' UNION has announced that the contract terms and prices for sugar beet for 1933-34 had been agreed as follows by the Union and the Beet Sugar Factories Committee:—(a) 40s. per ton for 15½ per cent. sugar content beet, with an addition or deduction at the rate of 2s. 6d. for each 1 per cent above or below in respect of Allscott, Brigg, Kidderminster, Poppleton and Selby factories. (b) 38s. per ton for 15½ per cent. sugar content beet, with an addition or deduction at the rate of 2s. 6d. for each 1 per cent. above or below in respect of Bardney, Bury, Colwick, Felstead, Peterborough, Spalding and Lissington factories. (c) When the Government assistance plus the sugar price shall exceed 18s. 6d. per cwt. the basic price per ton of beet to be paid to the growers will be increased as follows: When the Government assistance plus the sugar price exceeds 18s. 6d., but does not exceed 19s., the increase to the basic price will be 6d., and so on at the same scale.

Non-Ferrous Metals

IT IS UNDERSTOOD that the Zinc Cartel has been renewed for another year as from January 1 next. This had been anticipated in market circles. While particulars are not yet available, there is little doubt that the basis of restriction will be unchanged.

AN EARLY MEETING of world copper producers has been arranged. Under present plans, the meeting is to be held in New York. Efforts will probably be made at the meeting to arrive at an agreement on the question of the extension of copper restriction for next year.

AT AN EXTRAORDINARY MEETING of Indian Copper Corporation, Ltd., and at a meeting of the debenture holders, held this week, the scheme for the increase of the authorised capital to £900,000 and the creation of 2,202, 7½ per cent. first mortgage debentures of £100 each was approved. Of these debentures 1,600 are to be issued immediately, and their holders and the existing debenture holders will have the right to convert into ordinary shares up to December 31, 1939, at the rate of 800 2s. shares for every £100 of debentures.

Artificial Silk

A PETITION FOR THE WINDING-UP of Atlas Artificial Silk Processes, Ltd., will be heard on October 31.

MR. E. MALONEY, of 11 Ironmonger Lane, E.C.2, has been appointed receiver and manager of the Rayon Manufacturing Co. (1927), Ltd., under powers contained in a debenture dated March 26, 1928.

THE REPORT OF ALLIANCE ARTIFICIAL SILK, LTD., for the fifteen months ended March 31, 1932, shows clearly that the affairs of the company have gone from bad to worse. During the period there were losses on sales of plant and machinery amounting to £7,835, losses on loans to Atlas Artificial Silk Processes, Ltd., amounting to £15,658, and litigation costs involving the company in £51,962. The net result is that the debit balance in the balance-sheet is increased to £175,932, against £73,822 at the date of the previous report. Liquid assets have been virtually exhausted; cash is reduced from 11,029 to £699, and debtors from £6,141 to £1,033, while sundry creditors amount to £4,046 (against £5,266). The directors are confident that the necessary new finance can be found when the long-promised capital reorganisation is carried through.

Dyeing and Cleaning

IT IS ANNOUNCED that the dividend on the preference shares of Associated Dyers and Cleaners, Ltd., due on October 31, will not be paid. This dividend has been paid to April 30, 1932. No ordinary dividend was paid in 1931, against 6 per cent. in 1930.

Iron and Steel

THE SKINNINGROVE STEELWORKS will cease operations from the beginning of next month until early in March in order to carry out a reorganisation of the steel manufacturing plant. About 1,200 men will be idle. Of the four blast furnaces at present in operation, one is to be blown out and the remainder damped down. The furnaces are supplied by the Loftus ironstone mine of Pease and Partners, in consequence of which this mine will be closed. Only 13 blastfurnaces will now be working on the North East Coast.

THE IMPORT DUTIES ADVISORY COMMITTEE has decided that the existing iron and steel duties, amounting to 33⅓ per cent. *ad valorem* should be continued for a further period of two years as from October 25, and a Treasury Order to that effect has been issued. The committee states in its report that the continuance of the duties is subject to satisfactory progress being made in the preparation of a reorganisation scheme. If, when this scheme is ready, the extension of the period of protection has not put an end to foreign dumping, the committee will recommend further protective measures.

Prices of Chemical Products

Review of Current Market Conditions

THE demand has been well maintained in the London chemical market and in view of the position of the exchange prices have a firmer tendency. The coal tar products market is unchanged from last week. Prices remain the same, with stocks still short. Last week-end's settlement of the Lancashire cotton spinning dispute has removed a threat which has been hanging over the district for some months. Present hopes are for some improvement of business in consequence of the lower production costs, and the chemical market stands to benefit directly. Meanwhile, the demand for most lines of chemicals during the past week has been on a moderate scale, with business largely confined to near positions. Deliveries against contracts are not unsatisfactory. A steady tone continues in most sections. Inquiries for home and export have been more numerous in the Scottish heavy chemical market during the past week. Prices generally remain steady. Owing to pressure on space we are unable to give the full price lists this week. The following price changes are reported, the prices for other chemical products remaining the same as those given in pages 393-394 last week.

General Chemicals

ACID, CITRIC.—MANCHESTER: 10¼d. to 10½d. per lb.

ACID, FORMIC.—LONDON: £52 per ton.

ACID, OXALIC.—LONDON: £48 5s. per ton in casks, £52 to £56 in kegs.

ACID, TARTARIC.—SCOTLAND: B.P. crystals, 10½d. per lb.; carriage paid.

ARSENIC.—LONDON: Cornish nominal, £23 per ton f.o.r mines. MANCHESTER: White powdered Cornish, £25 at mines.

POTASH, CAUSTIC.—MANCHESTER: £30 per ton.

POTASSIUM CHLORATE.—MANCHESTER: £37 per ton.

Pharmaceutical and Fine Chemicals

ACID, TARTARIC.—10¾d. per lb.

MENTHOL.—A.B.A. Recryst. B.P., 13s. per lb.

QUININE SULPHATE.—2s. 5d. per oz.

ESSENTIAL OILS.—Camphor, White, 85s. per cwt.; Peppermint, Japanese, 4s. 9d. per lb.

Coal Tar Products

ACID, CARBOLIC.—Crude 60's, 2% water, 2s. per gal.

ANTHRACENE OIL.—Strained, 4½d. per gal.

CREOSOTE.—MANCHESTER: 2¾d. to 3¾d. per gal.

TOLUOL.—Pure, 2s. 4d. to 2s. 8d. per gal.

Nitrogen Fertilisers

NITRATE OF SODA.—Home prices, £8 9s. for October and £8 10s. for November, per ton, delivered to farmers' nearest station in 6-ton lots.

Inventions in the Chemical Industry

Specifications Accepted and Applications for Patents

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications Accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Specifications Accepted with Dates of Applications

PROCESS AND APPARATUS FOR THE PRODUCTION AND MANUFACTURE OF MATERIAL IMPREGNATED WITH CELLULOSE REGENERATED FROM VISCOSE, OR OTHER CELLULOSIC SOLUTION. A. H. Kilner. April 16, 1931. 381,950.

MANUFACTURE OF EMULSIONS. W. W. Groves (*I. G. Farbenindustrie*). May 27, 1931. 381,933.

PROCESS FOR THE MANUFACTURE OF CONDENSATION PRODUCTS OF THE ANTHRAQUINONE SERIES. A. Carpmael (*I. G. Farbenindustrie*). July 3, 1931. 381,954.

MANUFACTURE OF ANTHRAQUINONE DERIVATIVES. A. G. Bloxam (*Soc. of Chemical Industry in Basle*). July 6, 1931. 381,942.

PROCESSES FOR DYEING MATERIALS MADE FROM CELLULOSE ESTERS OR ETHERS. A. G. Bloxam (*Soc. of Chemical Industry in Basle*). July 6, 1931. 381,943.

MANUFACTURE OF AZO-DYESTUFFS INSOLUBLE IN WATER. W. W. Groves (*I. G. Farbenindustrie*). July 6, 1931. 381,944.

REMOVAL OF TIN FROM ANTIMONIAL LEAD AND OTHER METALS OR ALLOYS OF LOW MELTING POINT. E. L. W. Byrne (*American Smelting and Refining Co.*). July 6, 1931. 381,955.

MANUFACTURE OF VAT DYESTUFFS. A. G. Bloxam (*Soc. of Chemical Industry in Basle*). July 7, 1931. 381,920.

MANUFACTURE OF 6-BROMO-2-HYDROXY-3-NAPHTHOIC ACID. W. W. Groves (*I. G. Farbenindustrie*). July 14, 1931. 381,947.

MANUFACTURE OF SODIUM ALUMINATE. Imperial Chemical Industries, Ltd., L. M. Clark, and H. M. Spittle. July 17, 1931. 381,971.

MANUFACTURE OF ALIPHATIC ANHYDRIDES. H. Dreyfus. July 15, 1931. 381,963.

PRODUCTION OF HIGHLY ACETYLATED CELLULOSE ACETATES. A. H. Stevens (*E. Berl*). Aug. 6, 1931. 381,991.

METHOD OF IMPROVING THE TASTE AND SMELL OF FISH OILS. I. G. Farbenindustrie. Oct. 21, 1930. 382,060.

PROCESS FOR CONCENTRATING NITRIC SOLUTIONS AND DENITRIFYING NITRIC-SULPHURIC ACID MIXTURES. U. Orlandi and G. Levi. Nov. 21, 1930. 382,101.

PROCESS FOR MIXING NON-HOMOGENEOUS FINELY DIVIDED SOLID MATERIALS. W. W. Triggs (*International Precipitation Co.*). Dec. 8, 1931. 382,113.

MANUFACTURE OF ORGANIC NITRATES APPLICABLE IN THE EXPLOSIVES INDUSTRY. A. Hough. Dec. 15, 1931. 382,123.

DEMETHYLATION OF ALKALOIDS CONTAINING METHOXY GROUPS. Boots Pure Drug Co., Ltd., F. L. Pyman and H. Levene. Dec. 19, 1931. 382,124.

MANUFACTURE OF FERTILISERS HAVING A BASE OF AMMONIUM MAGNESIUM PHOSPHATE. R. Durand-Gasselin. Dec. 30, 1931. 382,127.

METHOD OF PREPARING FERTILISERS. R. Schubert. Jan. 5, 1932. 382,128.

MANUFACTURE OF ANIMAL AND VEGETABLE GLUES AND GELATINOUS MATERIALS GENERALLY. Dow Chemical Co. Feb. 2, 1931. 382,152.

PROCESS FOR MANUFACTURE OF SODIUM BICARBONATE. H. Lawarree. Feb. 16, 1931. 382,167.

PRODUCTION OF DOUBLE FLUORIDES OF ALUMINIUM AND ALKALIS. Dr. A. L. Mond (*I. G. Farbenindustrie*). March 2, 1932. 382,183.

PROCESS FOR THE MANUFACTURE OF A PHOSPHORIC ACID ESTER OF GLUCONIC ACID. Schering-Kahlbaum Akt.-Ges. Aug. 26, 1931. 382,262.

Complete Specifications open to Public Inspection

PROCESS FOR SENSITISING PHOTOGRAPHIC SILVER HALIDE EMULSIONS. I. G. Farbenindustrie. Oct. 10, 1931. 28194/32.

MANUFACTURE OF HALOGENATION PRODUCTS OF ACENAPHTHINDANDIONE DIKETIMIDES. I. G. Farbenindustrie. Oct. 10, 1931. 28195/32.

PROCESS FOR THE PRODUCTION OF METAPHOSPHATES SUITABLE FOR USE IN BAKING POWDERS. Chemische Fabrik Budenheim Akt.-Ges. Oct. 10, 1931. 28227/32.

PROCESS FOR THE MANUFACTURE OF READILY-SOLUBLE DERIVATIVES OF THE PYRIDINE SERIES. I. G. Farbenindustrie. Oct. 15, 1931. 16470/32.

MANUFACTURE OF MONO-*N*-ALKANOL DERIVATIVES OF AROMATIC DIAMINES AND POLY-AMINES. I. G. Farbenindustrie. Oct. 15, 1931. 20630/32.

MANUFACTURE OF TITANIUM COMPOUNDS. Titanium Pigment Co., Inc. Oct. 16, 1931. 27319/32.

PROCESS FOR THE MANUFACTURE OF THE GLUCOSIDES OF PHENOLS AND OF SUBSTANCES CONTAINING PHENOLIC HYDROXYL GROUPS. Dr. B. Helferich. Oct. 16, 1931. 27817/32.

MANUFACTURE OF DYESTUFFS. Soc. of Chemical Industry in Basle. Oct. 12, 1931. 27968/32.

PROCESSES OF BLEACHING BY MEANS OF HYPOCHLORITES. Soc. of Chemical Industry in Basle. Oct. 13, 1931. 28584/32.

PRODUCTION OF ARTIFICIAL RESIN FROM RESITE MASSES CONTAINING A CELLULOSE FILLING MATERIAL. Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Oct. 12, 1931. 28349/32.

PROCESS FOR PRODUCING CHEMICAL REACTIONS FROM GASES AND VAPOURS WITH AID OF A HIGH-TENSION ELECTRIC ARC. Soc. of Chemical Industry in Basle. Oct. 16, 1931. 28461/32.

MANUFACTURE OF HIGHLY VISCOSE PRODUCTS. I. G. Farbenindustrie. Oct. 12, 1931. 28462/32.

PROCESS FOR DRYING SUBSTANCES. Soc. of Chemical Industry in Basle. Oct. 17, 1931. 28747/32.

MANUFACTURE OF SYMMETRICALLY SUBSTITUTED AZOBENZENE COMPOUNDS. I. G. Farbenindustrie. Oct. 17, 1931. 28770/32.

MANUFACTURE OF AZO-DYESTUFFS. I. G. Farbenindustrie. Oct. 17, 1931. 28771/32.

Applications for Patents

MULTIPLE ALLOYS OF MAGNESIUM WITH ZINC, ETC. Osterreichisch Amerikanische Magnesit Akt.-Ges. Oct. 10. (Austria, Feb. 19.) 28191.

FRACTIONAL DISTILLATION OF VOLATILE LIQUIDS. W. J. Podbielniak. Oct. 13. 28597.

MANUFACTURE OF HARD-METAL ALLOYS. A. R. Powell. Oct. 11. 28313, 28314.

PROCESS FOR PRODUCING CHLORHYDROCARBONS. Ruhrchemie Akt.-Ges. Oct. 15. (Germany, Nov. 13, '31.) 28890.

PRODUCING CHEMICAL REACTIONS FROM GASES. Soc. of Chemical Industry in Basle. Oct. 12. (Switzerland, Oct. 16, '31.) 28461.

BLEACHING BY MEANS OF HYDROCHLORITES. Soc. of Chemical Industry in Basle. Oct. 13. (Switzerland, Oct. 13, '31.) 28584.

COLD BLEACHING PROCESS. Soc. of Chemical Industry in Basle. Oct. 13. (Switzerland, Oct. 13, '31.) 28585.

DRYING SUBSTANCES. Soc. of Chemical Industry in Basle. Oct. 14. (Switzerland, Oct. 17, '31.) 28747.

PRODUCTION OF TETRAHYDROFURFUR ALCOHOL. H. T. Böhme Akt.-Ges. Oct. 17. (Germany, Nov. 7, '31). 29033.

LIQUID OR PLASTIC PREPARATIONS. H. T. Böhme Akt.-Ges. Oct. 17. (Germany, Nov. 7, '31.) 29034.

DEVICE TO ASSIST STUDENTS IN MAKING CHEMICAL FORMULAE. J. R. Brittain. Oct. 20. 29316.

PREPARATION OF CALCINED TRI-ALKALI PHOSPHATES. Chemische Fabrik Budenheim Akt.-Ges. Oct. 19. (Germany, Oct. 21, '31.) 29280.

MANUFACTURE OF TERTIARY ORGANIC PHOSPHATES. Chemische Fabrik von Heyden Akt.-Ges., and W. W. Groves. Oct. 21. 29476.

DYEING. S. Coffey and Imperial Chemical Industries, Ltd. Oct. 17. 29005.

PRODUCTION OF HYDROCARBONS. H. E. Coley and L. O. Kekwick. Oct. 21. 29487.

HYDRATION OF OLEFINES. Distillers Co., Ltd., J. B. Dymock, W. P. Joshua, and H. M. Stanley. Oct. 18. 29116, 29117.

COATED AND IMPREGNATED MATERIALS. E. I. Du Pont de Nemours and Co. Oct. 18. (United States, Nov. 2, '31.) 29099.

MANUFACTURE OF ORGANO-LEAD SALTS OF PHENOLS....E. I. Du Pont De Nemours and Co. Oct. 18. (United States,, Oct. 20, '31.) 29112.

ANTISEPTIC ICE, AND ITS APPLICATION. E. I. Du Pont de Nemours and Co. Oct. 19. (United States, Oct. 22, '31.) 29235.

MANUFACTURE OF CELLULOSE NITRATE. E. I. Du Pont de Nemours and Co. Oct. 21. (United States, Oct. 22, '31.) 29472.

TREATMENT AND MANUFACTURE OF FUELS. J. L. P. Eudes. Oct. 17. (France, Oct. 17, '31.) 29041.

EXTRACTION OF LIQUID HYDROCARBONS FROM SOLID HYDROCARBONS. N. H. Freeman. Oct. 18. 29149.

MANUFACTURE OF MONO-AZO DYESTUFFS. J. R. Geigy Akt.-Ges., and W. W. Groves. Oct. 17. 28990.

MANUFACTURE OF PRODUCTS SIMILAR TO LUBRICATING OILS. J. Y. Johnson (*I. G. Farbenindustrie*). Oct. 20. 29364.

MANUFACTURE OF ASPHALTS. J. Y. Johnson (*I. G. Farbenindustrie*). Oct. 20. 29365.

MANUFACTURE OF HYDRO-RUBBER. J. Y. Johnson (*I. G. Farbenindustrie*). Oct. 22. 29576.

STRIPPING DYEINGS PREPARED WITH VAT DYESTUFFS. J. Y. Johnson (*I. G. Farbenindustrie*). Oct. 22. 29577.

MANUFACTURE OF ARTIFICIAL THREADS. I. G. Farbenindustrie. Oct. 19. (Germany, Oct. 19, '31.) 29246.

MANUFACTURE OF DISPERSIONS OF CONVERSION PRODUCTS OF RUBBER. I. G. Farbenindustrie. Oct. 21. (Germany, Oct. 24, '31.) 29483.

MANUFACTURE OF AZO-DYESTUFFS. I. G. Farbenindustrie. Oct. 22. (Germany, Oct. 26, '31.) 29582.

UTILISATION OF SOLID CARBON DIOXIDE AS REFRIGERATOR. Imperial Chemical Industries, Ltd. Oct. 20. 29387.

From Week to Week

THE TARMAC WORKS at Dowlais, South Wales, at which 150 men have been employed on converting slag into road-making material, have closed down, but may reopen if trade warrants.

RAPID TESTING BY FLUORESCENCE is the subject of an interesting brochure issued by the British Hanovia Quartz Lamp Co., Ltd., of Slough. This brochure contains a brief outline of practical uses for the analytical quartz lamp, chiefly with regard to foodstuffs, oils and fats, chemicals and drugs, paper, leather, textiles, rubber and paint and varnish.

PROFESSOR J. E. COATES presided last week over the first meeting of the new session of the West Wales section of the Society of Chemical Industry. The meeting, held in the lecture hall of University College, Swansea, attracted a large attendance and considerable interest was shown in the industrial films screened during the meeting—"The Story of Sulphur," and "Wallerscote and Winnington Works of Imperial Chemical Industries, Ltd."

UNILEVER, LTD., AND UNILEVER N.V. announce that the interim dividend on the ordinary shares will be declared at a meeting of the board which will be held on November 17, and will be paid on December 2. Last year's interim was 4 per cent., with a final dividend at the same rate. The dividends were declared in Dutch cents, and as a result of the depreciation in sterling were each equal to approximately 5 per cent. in sterling.

A LIST OF COMMODITIES which may be imported into Turkey free of duty and transaction tax during the fiscal year June 1, 1932, to May 31, 1933, has been issued by Turkish authorities. This exemption applies only to raw materials for use in specific local industries and includes carbon bisulphide, trichlorethane, dextrine, caustic soda, celluloid and plastics products, aniline, alizarine, and other dyes, beta-naphthol, sulphuric acid, hydrochloric acid, formic acid, and oxalic acid.

SIR HERBERT BLAIN has been nominated to succeed the late Lord Brentford as president of the National Safety First Association. Sir Herbert, who is one of the vice-presidents, was the founder of the "safety first" movement sixteen years ago, and has, ever since, taken an active part in its development. He was for many years with the London Underground Railways and London General Omnibus Co., and is now deputy chairman of the Avon India Rubber Co., a director of the Pyrene and of several other companies, and an underwriting member of Lloyds.

THE FOURTH OF THE LIVERSIDGE LECTURES, founded in accordance with the will of the late Professor A. Liversidge, F.R.S., of the University of Sydney, will be given before the Chemical Society in the Medical Lecture Theatre, Birmingham University, on November 25, at 5.30 p.m., by Dr. F. W. Aston, F.R.S. The title of the lecture is "Physical Atomic Weights." Admission is free (without ticket). An informal dinner will be held at the Queen's Hotel (New Street), at 7.30 p.m., the cost of the dinner being 8s. (excluding wines). Those desiring to attend the dinner should communicate with Dr. W. Wardlaw, F.I.C., the University, Edgbaston, Birmingham, by November 18.

MR. JUSTICE EVE, in the Chancery Division, on Friday, October 21, heard a motion in a debenture holder's action, Blackburn v. Pharmaceutical Corporation, Ltd., for the appointment of a receiver and manager of the company's assets. Mr. Preston, K.C., for the debenture holders, said the company was formed last year to exploit a certain antiseptic preparation under the name of Novutox acquired from Mr. Gordon, who was one of the directors. But it found itself short of capital and debentures were issued. Disputes arose between the directors and there was a deadlock, and it was necessary to find money for the payment of wages that week-end. The company had not sufficient funds in hand for that purpose. Mr. H. S. G. Buckmaster, for the company, opposed the motion, and said Mr. Gordon would find the money for wages. He denied the allegations made by the plaintiff that there was a case of jeopardy. His lordship said he would not appoint a receiver and manager of the undertaking to pay wages and he would adjourn the motion to a day to be fixed yesterday (Friday).

THE HISTORICAL DEVELOPMENT of the solvent industry was described by Mr. F. W. Clark, of British Industrial Solvents, Ltd., in an address to the Yorkshire Section of the Society of Chemical Industry. He explained how many products which were until recent times rare chemicals are now available in huge quantities. The oldest processes were the production of alcohol by fermentation of corn, sugar and molasses, and acetic acid, alcohols, and so on, by the destructive distillation of wood. In modern processes solvents were obtained in the distillation of coal, in the distillation of petroleum, from fermentation of vegetable matter, from natural gas and water gas, and from the hydrogenation and low temperature carbonisation of coal. Discussing the economic aspect of the geographical distribution of raw materials, Mr. Clark said that as potential sources of solvents the United States had corn, maize, and petroleum and water power in abundance for cheap electricity. Great Britain had none of these advantages, but had a plentiful supply of coal, which was already the origin of valuable solvent materials and a potential source of more.

THE PETITION FOR THE WINDING-UP of the Non-Inflammable Film Co., Ltd., which was fixed to be heard on the first petition day in October, has been allowed to stand over until November 14.

CONSIDERABLE PROGRESS HAS BEEN MADE in the erection of the new titanium plant of National Titanium Pigments, Ltd., at Luton, which has been designed to meet the requirements of the Empire market.

THE ROSE PATENT FUEL WORKS, King's Dock, Swansea, has resumed operations after being idle since last April. All the workers formerly employed—just over 250—will be back at work before the end of the month.

DR. JOHN T. STEARN, who, during the past two years, has been in charge of the production department of Toledo Synthetic Products, Inc., manufacturer of "Plaskon," a urea-formaldehyde molding compound, has rejoined the investigatory staff of the Mellon Institute of Industrial Research, Pittsburgh, where he will head the industrial fellowship sustained by this company. Dr. A. M. Howald, former holder of the same fellowship, is now engaged in production research in the company's plant in Toledo, Ohio.

FOR THE TWELFTH TIME, Sir Henry Sutcliffe Smith, a member of the Executive Committee of the Bradford Dyers' Association, has been elected chairman of the Colour Users' Association. Probably no man in the country has been more closely identified with the post-war dyestuffs problem than Sir Henry. He has always safeguarded the interests of colour users, whilst realising the importance of establishing a prosperous dye-making industry in the interests of the nation.

THE RESOLUTIONS FOR THE REORGANISATION and reduction of the capital of the Chemical and Metallurgical Corporation, Ltd., passed at meetings held on June 21, have been duly sanctioned by the Court, and new certificates in respect of the preference and ordinary shares in the reduced capital were anticipated to be ready for delivery at the company's offices this week. The company has received an amount in cash sufficient to enable it to purchase fractions of ordinary and preference shares at par, *i.e.*, 4d. per ordinary share and 10s. per preference share.

THE IMPORT DUTIES ADVISORY COMMITTEE gives notice of an application for the addition of "Lux" gas-purifying material (bog ore substitute) to the free list. Any representations which interested parties desire to make in regard to these applications should be addressed in writing to the Secretary, Import Duties Advisory Committee, Caxton House (West Block), Tothill Street, London, S.W.1, not later than November 14, 1932. The committee further announces that it has decided not to make any recommendations in respect of the applications previously advertised for the imposition of increased duties on ceramic transfers and on superphosphates.

PLANT FOR THE MANUFACTURE OF CELLOPHANE, recently completed at Shawinigan Falls at a cost of $1,250,000, is already too small, and its capacity is to be doubled at once. Spruce pulp sheets are the chief raw material used in the preparation of the viscose solution from which the cellophane is made. Wood pulp is treated with a solution of caustic soda, and after shredding and further treatment with carbon bisulphide, an orange cellulose xanthate is produced which is mixed with a solution of caustic soda, forming the liquid viscose for casting into sheets. The sheets are formed under pressure in an acid bath, and after washing and bleaching and treatment with glycerol to increase pliability, they emerge in the finished form. Cellophane is produced by a process quite similar to that used in the manufacture of viscose silk, the main difference being that the cellophane is cast in sheets, whereas the silk is produced in fine threads.

BUYERS visiting the 1933 British Industries Fair at Olympia and the White City will be charged 2s. for admission, receiving in exchange a badge admitting them for the period of the Fair, from February 20 to March 2. They will be admitted free, as hitherto, to the Birmingham section at Castle Bromwich. The new charge is being made because of the withdrawal, as part of the national economy campaign, of the Government publicity grant of £25,000, and the proceeds of the charge will be used to advertise the Fair. By this departure the British Industries Fair will be falling into line with the chief Continental fairs where in some cases the admisson charge to buyers s much higher. The charge wll help to limit attendances during the hours set aside for trade buying to legitimate buyers, some of whom have complained in the past of being hampered in their dealings by members of the public who had contrived to secure admission. Invitations to the Fair, which will be the largest on record, have already been sent out to 67,000 overseas buyers in ten different languages as part of an intensified world campaign.

Obituary

SENATOR GIOVANNI PIRELLI, the founder of the rubber manufacturing firm which bears his name. In addition to the great Pirelli works at Milan and elsewhere in Italy and South America, he has installed a factory at Eastleigh, Southampton, for the manufacture of electrical transmission cables. Senator Pirelli was 84 years of age.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

[NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.]

ADLEY TOLKIEN & CO., LTD., Blackburn, chemical manufacturers. (M. 29/10/32.) Registered October 14, £2,500 debentures, general charge.

ALLIANCE ARTIFICIAL SILK, LTD., Oulton Broad. (M. 29/10/32.) Registered October 14, £7,000 debentures, part of £363,000; charged on properties at Oulton Broad, also general charge. *£113,000. June 23, 1931.

CERAMIC PRODUCTS, LTD., London, S.E. (M. 29/10/32.) Registered October 17, series of £500 (not ex.) debentures, present issue £300; general charge. *Nil. July 23, 1931.

Satisfaction

CHEMICAL AND METALLURGICAL CORPORATION, LTD., London, E.C. (M.S., 29/10/32.) Satisfaction registered October 14, £100,000, registered March 21, 1930.

London Gazette, &c.

Receiverships

RAYON MANUFACTURING CO. (1927), LTD. (R. 29/10/32.) E. Maloney, C.A., of 11 Ironmonger Lane, E.C.2, was appointed receiver and manager on October 13, under powers contained in debenture dated March 26, 1928.

BARNSLEY CHEMICAL CO., LTD. (R. 29/10/32.) H. A. Dawson, secretary, of Moorland Court, Gawber Road, Barnsley, was appointed receiver on October 14, under powers contained in debentures dated Nov. 9, 1932.

Forthcoming Events

Oct. 31.—Electroplaters' and Depositors' Technical Society. "The Adhesion of Electrodeposited Nickel to Brass." A. W. Hothersall. 7 p.m. Birmingham Chamber of Commerce (Assembly Room).

Nov. 1.—Royal Institution. "Rays and Radiations." E. N. da C. Andrade. 5.15 p.m. 21 Albemarle Street, London.

Nov. 1.—Hull Chemical and Engineering Society. "Industrial Waste Recovery." R. J. Smith. 7.45 p.m. Grey Street, Park Street, Hull.

Nov. 1.—Business Research and Management Association of Great Britain. "Industrial Revival Through Regional Planning." Hugh Quigley. 6.45 p.m. Anderton's Hotel, Fleet Street, London.

Nov. 2.—British Road Tar Association. Annual Meeting. Hotel Metropole, Northumberland Avenue, London.

Nov. 2.—Institute of Physics. "Physics in Meteorology." Dr. G. C. Simpson. 5.15 p.m. 21 Albemarle Street, London.

Nov. 2.—Society of Public Analysts. 8 p.m. Burlington House, London.

Nov. 2.—Royal Society of Arts. "Beauty in Industry." John A. Milne. 8.30 p.m. John Street, Adelphi, London, W.C.2.

Nov. 2.—British Association of Chemists (Manchester Section). Smoking concert. 7 p.m. Grand Hotel, Manchester.

Nov. 3.—Institution of the Rubber Industry. "Aeroplane Covers and Wheels." F. Fellowes. Grand Hotel, Birmingham.

Nov. 3.—The Chemical Society. Ordinary Scientific Meeting. 8 p.m. Burlington House, London.

Nov. 3.—Institute of Metals (Sheffield Section). "Nickel Silver Alloys for the Electro-Plate Trades." W. R. Barclay. 7.30 p.m. University, Sheffield.

Nov. 4.—Society of Chemical Industry and Institute of Chemistry (Glasgow). "Ceramic Insulators: their Manufacture and Testing." C. S. Garland. 7.30 p.m. Royal Technical College, Glasgow.

Nov. 4.—The Physical Society. 5 p.m. Imperial College of Science, South Kensington, London.

Nov. 4.—British Science Guild. Alexander Pedler Lecture. "Animals as a National Asset and Responsibility." Burton-on-Trent.

Company News

Venezuelan Oil Concessions, Ltd.—The board has decided to pay on November 8 an interim dividend of 5 per cent. on the preference and ordinary shares.

Ilford, Ltd.—The directors announce that dividends on the 6 per cent. cumulative preference and 6½ per cent. cumulative "A" preference shares for the half year ending October 31 will be paid on November 1, less tax.

Val de Travers Asphalte Paving Co.—In view of the present state of trade, the directors have decided to defer the consideration of the payment of a dividend until the trading results for the year are known. Last year shareholders received an interim of 2½ per cent. and a final of 3¾ per cent.

Midland Tar Distillers.—Dividend of 2½ per cent., free of tax, on ordinary shares, making 5 per cent. for year; £15,000 to general reserve; £5,000 to investment reserve; £29,805 forward. Last year there was no dividend on ordinary shares, £32,154 being carried forward, after providing for preference dividend.

Burmah Oil Co.—An interim dividend on the ordinary shares on account of 1932, of 5 per cent., less tax at 3s. 2½d., after allowing for relief in respect of Dominion tax is announced. The half yearly distribution in respect of 1931 was also 5 per cent., and was followed by a final dividend of 12½ per cent.

Electrolytic Zinc Co. of Australasia.—After transferring £145,000 to depreciation reserve, gross profit for the year ended June 30 last was £145,790, and net profit, after taking into account profit and loss items, including land and income tax, was £85,090. This added to £7,000 brought forward, made available £92,090, which was appropriated as follows: £15,900 carried to credit debenture sinking fund reserve; £60,000 in payment dividend No. 19 on Preference shares; £16,190 balance carried forward. For the previous year gross profit on working accounts was £221,721, less reserve for amortisation and depreciation £145,000, leaving £76,721, less profit and loss items, including land tax, income-tax, and provision for latter, £71,046, leaving net profit £5,678.

Chemical Trade Inquiries

Australia.—A Sydney business man, shortly returning to Australia, will be interested to hear from British manufacturers and wholesale chemists, desirous of extending their trade in Australia in druggists' sundries, chemists requisites, etc. Letters should be addressed to Mr. Robert Coverdale at 41 Belmont Road, Portswood, Southampton.

United States—An agent actively engaged in selling to the chemical and allied industries covering a territory along the Atlantic Coast, from New Haven Connecticut, to Baltimore, Maryland, wishes to secure agencies for British-made equipment to supplement the pumps and valves it is now handling, particularly such materials as chrome steel tubing and fittings, or perhaps machinery so long as it does not conflict with his present line. Recently he was offered a German agency but found the difference in standards of measurement, language, etc., a serious handicap, as compared with the handling of British made products. Catalogues and other necessary information, addressed to C.A/185, The Editor, THE CHEMICAL AGE, will be forwarded to the agent concerned.

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Holland.—A chemical engineer at Rijswijk wishes to obtain the representation of United Kingdom manufacturers of heavy and light chemicals and pharmaceutical products. (Ref. No. 560.)

Nicaragua.—A firm of agents in Managua desires to represent United Kingdom manufacturers of jute bags (for coffee and sugar); soap-making machinery; plantation machinery (coffee, rice and maize); transmission belts and conveyors. (Ref. 576.)

Egypt.—The Commercial Secretary to the Residency, Egypt, reports that the Department of Public Health, Cairo, is calling for tenders, to be presented in Cairo by January 2, 1933, for the supply of portable and stationary disinfecting plant. (Ref. A.X. 11562.)

Lithuania.—H.M. Consul at Kovno reports that the Lithuanian Railway Administration is calling for tenders, to be presented in Lithuania by November 10, 1932, for the supply of 200 tons of haematite pig iron. (Ref. G.X. 11498.)

Australia.—A firm of Sydney agents desires to secure the representation, on a basis to be arranged, for the whole or part of the Commonwealth of United Kingdom exporters of nitro-cellulose and solvents; Carnauba wax and residue; rubber (smoked sheet and pale crepe); moulding powder. (Ref. No. 530.)

Canada.—A manufacturers' agent at Vancouver is desirous of representing United Kingdom manufacturers of soft copper sheets, copper water tubing, brass pipe, copper pipe, copper bearing pipe, and brass pipe fittings, on a consignment or commission basis, in the Province of British Columbia. (Ref. No. 540.)

New Companies Registered

Atram, Ltd. Registered September 21. Nominal capital £1,000 in £1 shares. Importers, exporters and manufacturers of and dealers in rust-proofing and/or rust-preventing specialities, products, preparations, articles and other goods, etc. A subscriber: Rose Roth, 39 The Vale, Golders Green, London, N.W.11.

British Acetic Acid Company, Ltd., 34 Victoria Street, S.W.1. Registered October 4. Nominal capital, £100 in £1 shares. Manufacturers and sellers of acetic acid and derivatives of acetylene, etc. Directors: C. H. Bingham and A. P. Baker.

Coal Petroleum, Ltd., 3 Central Buildings, Westminster, London. Registered as a "private" company on September 16. Nominal capital £12,000 in £1 shares. The objects are to acquire any patent relating to the carbonisation, distillation or other treatment of carbonaceous materials or otherwise; to carry on business as manufacturers of patent fuel and coke, carbonisers and distillers of coal, shale and other substances, manufacturers of gas motor spirit, naphtha, oils, dyes, benzines, anthracenes, naphthalenes, and similar substances, research chemists, colliery proprietors, wood, peat, and fuel merchants, etc. Life directors: Sir Charles E. Hambro and Capt. A. G. Kyle.

L. A. Croxton, Ltd. Registered September 24. Nominal capital £1,000 in £1 shares. Manufacturers, refiners, distillers, grinders, boilers, importers and exporters of and dealers in white lead, zinc, paint, varnish, oil, tar, bitumen, casein, pitch and other road making materials, chemicals of all kinds, coal, coke and residual products, etc. A subscriber: E. E. Strong, 49 Avignon Road, Brockley, London, S.E.4.

Doncaster Coal Distillation, Ltd.—Registered October 4. Nominal capital, £100 in £1 shares. Distillers of coal, manufacturers of by-products from coal, coke manufacturers and merchants, gas makers, oil distillers and refiners, tar manufacturers, etc. A subscriber is B. L. Knight, 4 Brentwood Road, Romford, Essex.

English Clays Lovering Pochin & Company. Registered October 12. Nominal capital £325,000 in £1 shares (100,000 7 per cent. redeemable cumulative preference and 225,000 ordinary). Objects: to acquire the businesses carried on by English China Clays, Ltd., Lovering China Clays, Ltd., and D. H. Pochin & Co., Ltd., and their respective producing and selling subsidiaries and allied companies, and to carry on the business of producers, manufacturers, merchants and exporters of and dealers in china clay, china stone, ball clay, tiles, etc. Subscribers: H. N. Sporborg, 18 Austin Friars, E.C.2, C. W. Foster and five other solicitors.

Flexible Catgut Manufacturing Company, Ltd., 24 Marlborough Road, St. Albans, Herts.—Registered October 4. Nominal capital, £1,000 in £1 shares. Manufacturers of catgut for surgical, commercial and other purposes, dealers in sheep and other animals, live or dead stock, animal casings, chemicals, drugs and chemical and medical preparations, etc.

Fluorescent Zinc Oxides, Ltd., 35 Surrey Street, Strand, W.C.2. Registered September 24. Nominal capital £100 in £1 shares. Manufacturers of and dealers in zinc and other oxides, and particularly fluorescent zinc oxides and chemical products and compositions of all kinds, etc. Director: J. M. Brown .

Frederick Hampson, Ltd. Registered October 21. Nominal capital £10,000 in £1 shares. To acquire the business of a glass bottle manufacturer lately carried on by G. Frederick Hampson at Duncan Street, Salford, and to adopt an agreement with Mary A. Hampson, C. P. Hampson, F. Hampson and J. P. Hampson. Directors: C. P. Hampson, "Wentworth," Ellesmere Park, Eccles, F. Hampson, J. P. Hampson and Mary A. Hampson.

Jarman Brothers, Ltd., 42 Clare Street, Bridgwater. Registered September 29. Nominal capital, £2,500 in £1 shares. To acquire the business of a candle manufacturer and tallow refiner carried on by G. W. Jarman as Jarman Brothers at Clare Street, Bridgwater, Somerset, and to carry on the business of manufacturers of and dealers in soap and washing materials, oils, greases, perfumes, unguents, chemicals, etc. Directors: G. W. Jarman and C. C. D. Jarman.

Leopold Laserson, Ltd., 11 Beauchamp Street, Holborn, London, E.C.1. Registered September 20. Nominal capital £300 in £1 shares. Manufacturers of all kinds of synthetic, aromatic and other chemical products, distillers of essential oils, etc. Directors: J. W. Bobin and L. Laseron.

Massogene Products, Ltd. Registered October 13. Nominal capital £100 in £1 shares. Objects: to carry on the business of manufacturing chemists, manufacturers of and dealers in chemicals of all kinds, essential oils, embrocations, liniments, etc. Directors: L. C. Willsmer, 8 Stellman Street, Clapton, E.5; A. G. Willsmer, and H. E. A. Chinn.

Metal Processes, Ltd., Sardinia House, Kingsway, W.C.2. Registered October 13. Nominal capital £3,000 in 2,857 shares of £1 and 2,860 shares of 1s. each. Objects: To acquire from Inventions Developments, Ltd., of Sardinia House, Kingsway, W.C.2, certain metal processes, to buy, sell, export, import, manufacture or deal in chemicals, dyestuffs, soaps, detergents, varnishes, paints, coatings, oils and chemical products; and to carry on the business of treating metals with any chemical or other substances, etc. Directors: A. Slatter, Sardinia House, Kingsway, W.C.2, and W. J. Turner.

Regal Chemicals and Industrials, Ltd., Squirreltail Works, Knightland Road, Upper Clapton, London, E.5. Registered October 21. Nominal capital £500 in £1 shares. Objects to carry on the business of manufacturers and merchants of chemical, pharmaceutical and industrial products of all kinds, etc. Directors: S. Herman, D. Herman, I. Herman, J. Winfield and H. Scholey.

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APPLICATIONS are invited from qualified candidates for the appointment of a salesman for London area. Candidates should be chemists engineers experienced in the treatment of industrial waters. Applications should state full particulars and be accompanied by a photograph. Box No. 1442, THE CHEMICAL AGE, Bouverie House, 154 Fleet Street, London, E.C.4.

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(Prepaid—Twenty-seven words 1s. 6d.; every additional nine words 6d.) Replies can be received "Box , Office of this Journal," in which case our address is included in cost of advertisement, and charged as nine words.

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